Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

MARCH 24, 1947
VOLUME 36, No. 6

AMERICAN DYESTUFF REPORTER

APR 7
GREENVILLE PUBLIC LIBRARY

IT'S *Ponsol** BROWN RBT PASTE

"PONSOL" Brown RBT Paste produces cocoa brown shades having outstanding fastness to light... very good resistance to washing, chlorine, crocking and cold- and salt-water spotting... good fastness to hot moist pressing, perspiration and dry cleaning.

This anthraquinone vat color gives excellent results by pad-jig application as well as by the Du Pont Pad-Steam Continuous Dyeing Process. It may also be used in package or circulating-type dyeing machines.

"PONSOL" Brown RBT Paste is a good base for chocolate browns and is equally suitable as a shading color. It is especially well adapted to use on cotton and viscose rayon materials for sportswear, upholstery and drapery fabrics, shirtings, and uniform cloths.

E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Del.

*Reg. U. S. Pat. Off.

Du Pont Dyestuffs
BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY
DUPONT

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

SUPERLITEFAST

Best dye under the sun for

Spun Rayon

YOUR PROBLEM!

. . . is to find practical, *dependable* dyes which are not impaired by the use of curable RESIN FINISHES to keep spun rayon garments free from crushing and wrinkling . . . dyes which are *really* FAST to light and FAST to laundering. And you must have the right solution to this problem if you are to satisfy your customers and safeguard their vast Spun Rayon sales volume which is much more important today than ever before.

OUR SOLUTION!

. . . is "Superlitefast" . . . the special line of Azo dyes which positively are NOT impaired by the use of curable resin finishes and which also assure you of *maximum* fastness. While regular standards require only a 40 hour Fadeometer test, "Superlitefast" dyes will stand 100, 150 and up to 300 hours. While a 105° F Launderometer test is acceptable, "Superlitefast" dyes will stand the 160° F test. And the color range is COMPLETE.

YOUR PROOF!

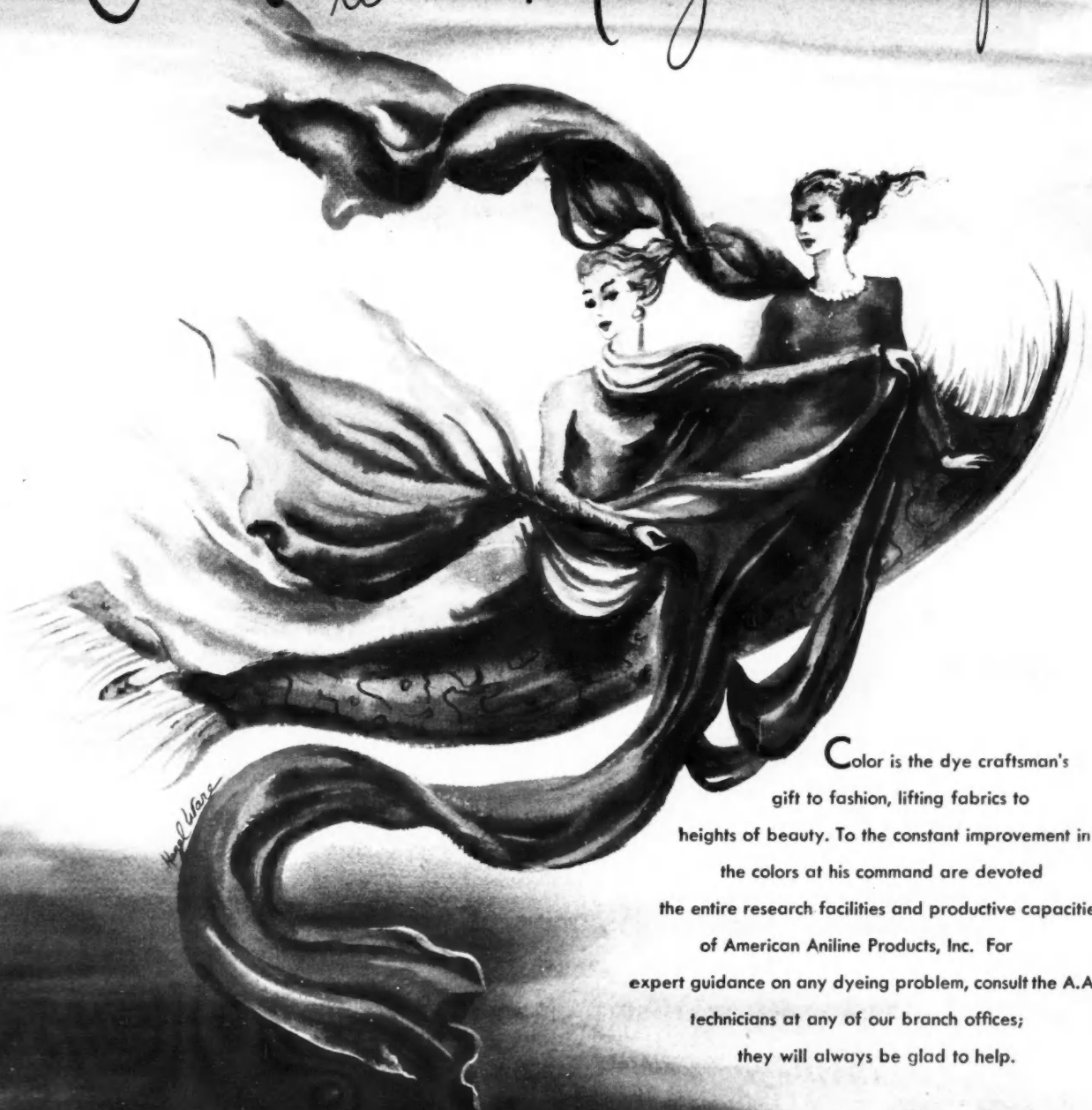
. . . is to make FREE use of our Technical Staff and Laboratory Service. Send us a sample of any rayon or other fabrics and the shade you desire. We will match the shade with "Superlitefast" dyes—dye up samples—test them thoroughly for sun and washing fastness — then send you a complete outline of the procedure and formula in a permanent DATA BOOK. Use this trouble-free service NOW.

ALTHOUSE

Chemical Company

READING • PA.

Color is a Magic Carpet



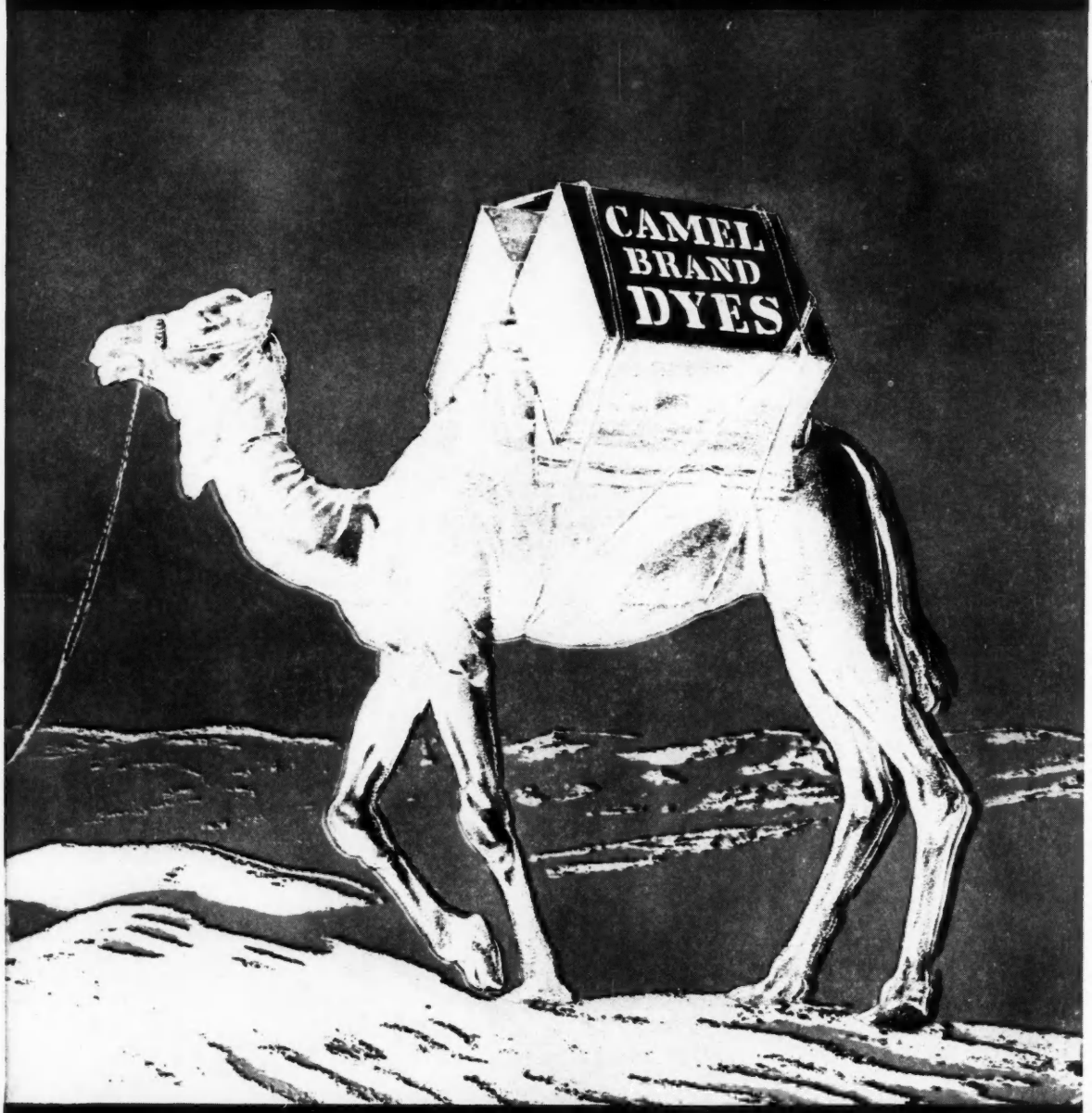
Color is the dye craftsman's gift to fashion, lifting fabrics to heights of beauty. To the constant improvement in the colors at his command are devoted the entire research facilities and productive capacities of American Aniline Products, Inc. For expert guidance on any dyeing problem, consult the A.A.P. technicians at any of our branch offices; they will always be glad to help.

AMERICAN ANILINE PRODUCTS, INC.

50 UNION SQUARE, NEW YORK, N. Y.
Plant: Lock Haven, Pa.
Branches: Boston, Mass. · Providence, R. I.
Philadelphia, Pa. · Charlotte, N. C. · Chicago, Ill.
Los Angeles, Cal. · Chattanooga, Tenn.
Dominion Anilines & Chemicals Ltd.
Toronto, Canada · Montreal, Canada

QUALITY DYESTUFFS

SINCE 1878



JOHN CAMPBELL & COMPANY, INC.

75 HUDSON STREET • NEW YORK CITY

TELEPHONE: BArclay 7-6228-6229

PHILADELPHIA: BROAD AND SPRING GARDEN STS.

BRANCH OFFICES AND WAREHOUSES:

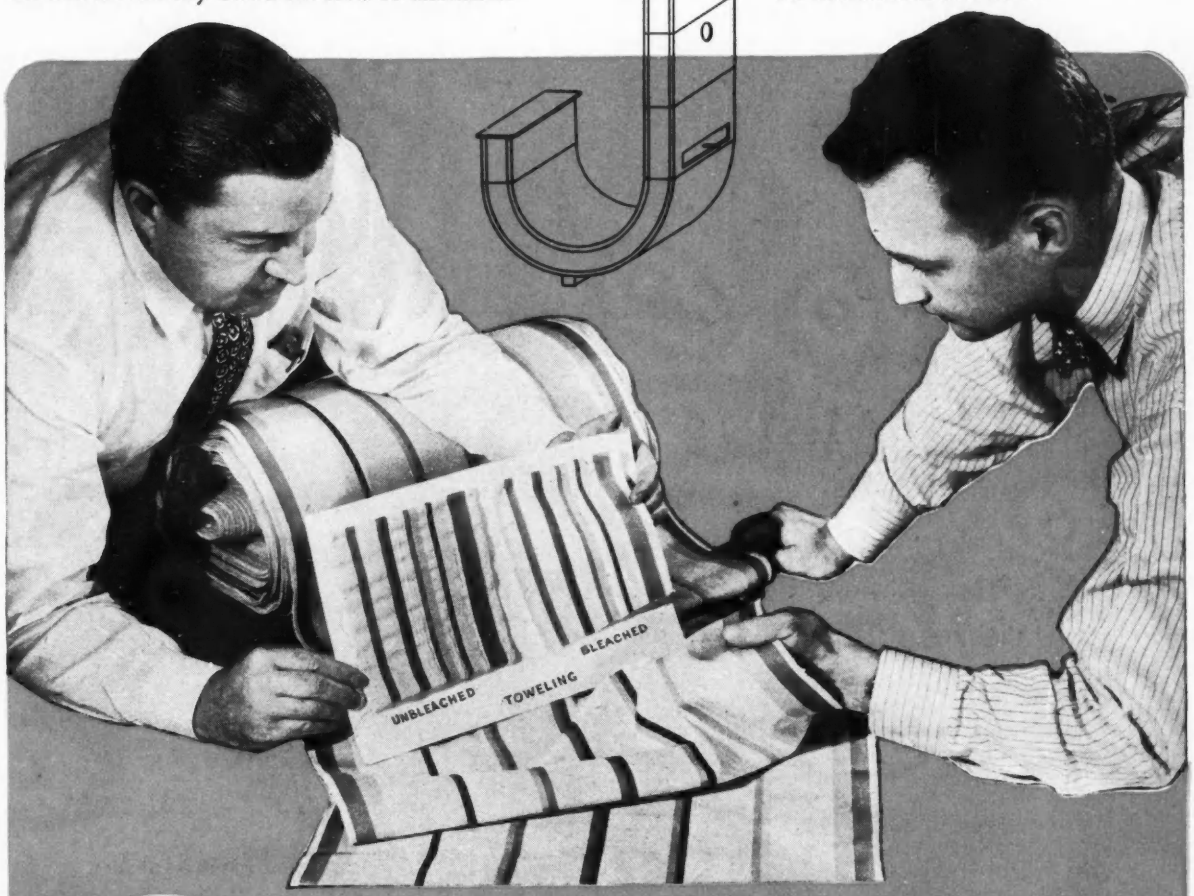
BOSTON EAST CLEVELAND, OHIO ATLANTA, GA.

American Dyestuff Reporter, Vol. 36, No. 6, March 24, 1947. Published every other Monday. Copyright, 1947, by Howes Publishing Co., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00; Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919 at the New York, N. Y., Post Office, under the act of March 3, 1879.

It's RESULTS you want!

AND there is no other system or method of bleaching that will give you better results than Becco Continuous Steam Bleaching. Ask any user! He will tell you that the Becco Continuous Steam Bleaching System saves equipment because two "J" boxes do the work of nine kiers; that there is a saving up to 55 per cent in floor space; that savings in steam go as high as 75 per cent; that savings in labor and chemical costs reach 40 per cent; that Becco Hydrogen Peroxide is easy to handle being mechanically pumped to the point of use; that the finished product is of a superior quality than that bleached with any other method or chemical.

Don't take chances on your bleaching and finishing operations. Don't experiment and make unnecessary expenditures. Becco Engineers and Chemists have many years of specialized bleaching and finishing experience and it can be yours, *free*! Just drop a note requesting that Becco experts make a survey of your plant and recommend the most efficient and economical method of bleaching, considering the volume of textiles bleached. Their report will be honest and unbiased.



BECCO

BECCO SALES CORPORATION

AGENTS FOR BUFFALO ELECTRO-CHEMICAL COMPANY, INC.

2 Sawyer Avenue, Buffalo 7, N. Y.

New York Boston Philadelphia Chicago Charlotte

Score at the FINISH!

Whether the goal is sales or sports . . . it's the *finish* that counts. Hosiery, and other textile products . . . to have *sales appeal* must have *eye appeal.*

For all your textile chemical needs . . . detergents, wetting agents, water repellents, cationic softeners, etc., you can depend on Fancourt materials and "know-how" to help you cash in *at the finish.*

See Us At The
Knitting Arts Show
in ATLANTIC CITY
April 29 to May 2
Booths 341 and 342

W. F. FANCOURT & CO.

PHILADELPHIA, PA.

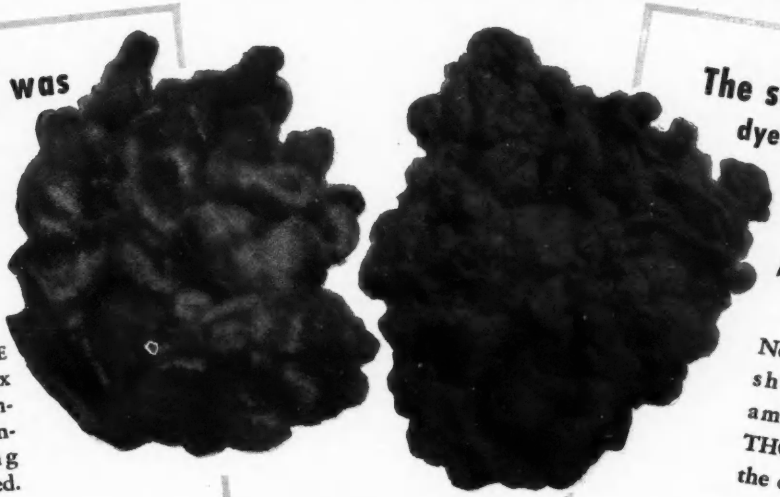
In the South, Howard A. Virkler, Greensboro, N. C.

Solving Finishing Problems Since 1904

TIPPY WOOL ?

This wool was dyed in the ordinary way

An ACID BLUE (Color Index No. 208) considered an uneven dyeing color, was used.



The same wool— dyed with the same color, but with the aid of ANTHOMINE

Note the uniform shade. A small amount of ANTHOMINE made the difference.

TRY ANTHOMINE !

(PATENT APPLIED FOR)

TO ELIMINATE UNEVEN DYEINGS

- . . . QUICKER AND BETTER EXHAUSTION OF THE DYEBATH
- . . . A SOFTER, MORE PLEASING "HAND"
- . . . SUBSTANTIAL INCREASE IN COLOR YIELD
- . . . NO SACRIFICE OF BRIGHTNESS OR FASTNESS
- . . . PROCESSING TIME REDUCED

Although it has only recently been released for general sale, ANTHOMINE has been used and tested by many mills for more than a year. Colors and wool with tendencies toward uneven and tippy dyeing were especially selected for testing.

The results of actual mill use of ANTHOMINE in dyeing stock, yarn, or piece goods confirmed the hundreds of tests made in our laboratories.

Thus, ANTHOMINE is now offered to the trade as a tried and tested solution to the tippy wool dyeing problem with an assurance born of complete success in dyehouse.

Write for Technical Service Bulletin No. 203.100.1

Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

NEWARK, NEW JERSEY

NYANZA

ANILINE & ALIZARINE COLORS

•

TEXTILE CHEMICALS

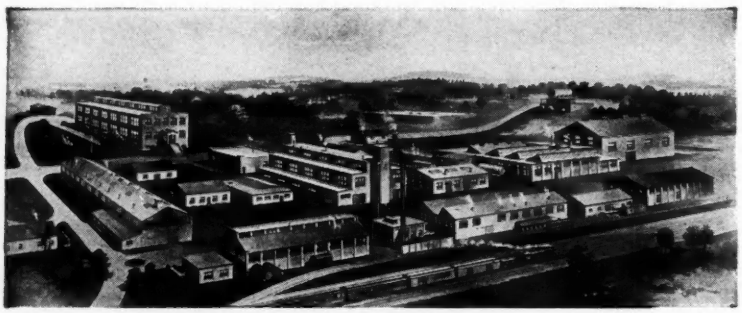
•

FINISHING MATERIALS

FOR

WOOL — COTTON — RAYON — ACETATE

AND MIXED FIBERS



FACTORY AT ASHLAND, MASSACHUSETTS

NYANZA COLOR & CHEMICAL COMPANY, Inc.

215 WATER STREET NEW YORK CITY

FACTORIES:

CHEMICAL MANUFACTURING CO., ASHLAND, MASS. • NEW BRUNSWICK CHEMICAL CO., NEWARK, N. J.

BRANCHES:

Ashland, Massachusetts

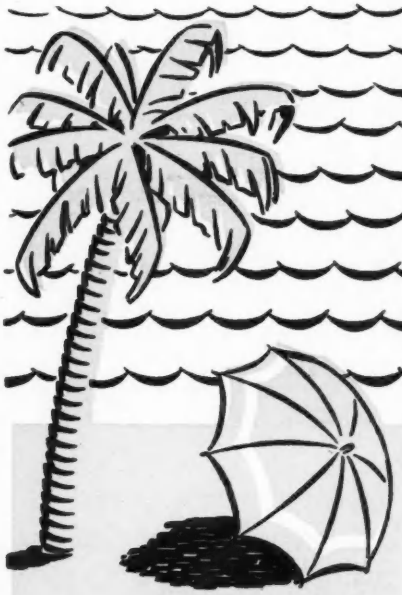
549 West Randolph St., Chicago, Ill. • 635 Drexel Bldg., Philadelphia, Pa. • 115 S.W. Fourth Ave., Portland, Ore.

2657 Magnolia Ave., Knoxville, Tenn. • 304 E. Morehead St., Charlotte, N. C.

CANADIAN AGENTS:

Charles Albert Smith Limited, 123 Liberty St., Toronto, Canada

Footprints ON THE SANDS OF SUMMER STYLE



Short-lived as the season for gay summer prints and colorful pastels may be . . . patterns must be sharp and clear . . . colors rich and lasting. Keltex, the modern algin thickening agent, insures true, brilliant—enduring—color values.

Keltex is adaptable to machine or screen printing. It assures exact printing paste viscosity and provides perfect penetration, a true, even penetration. Because it stops color migration, it is used extensively in pad pigment dyeing of vats and indigosols.

Keltex provides sharp, brilliant prints faster, quicker and more economically. It is a product of nature—free of impurities—exactly processed to produce consistent, uniform results. Drop us a line for complete information.

KELTEX
REG U.S. PAT OFF
REFINED ALGIN PRODUCT

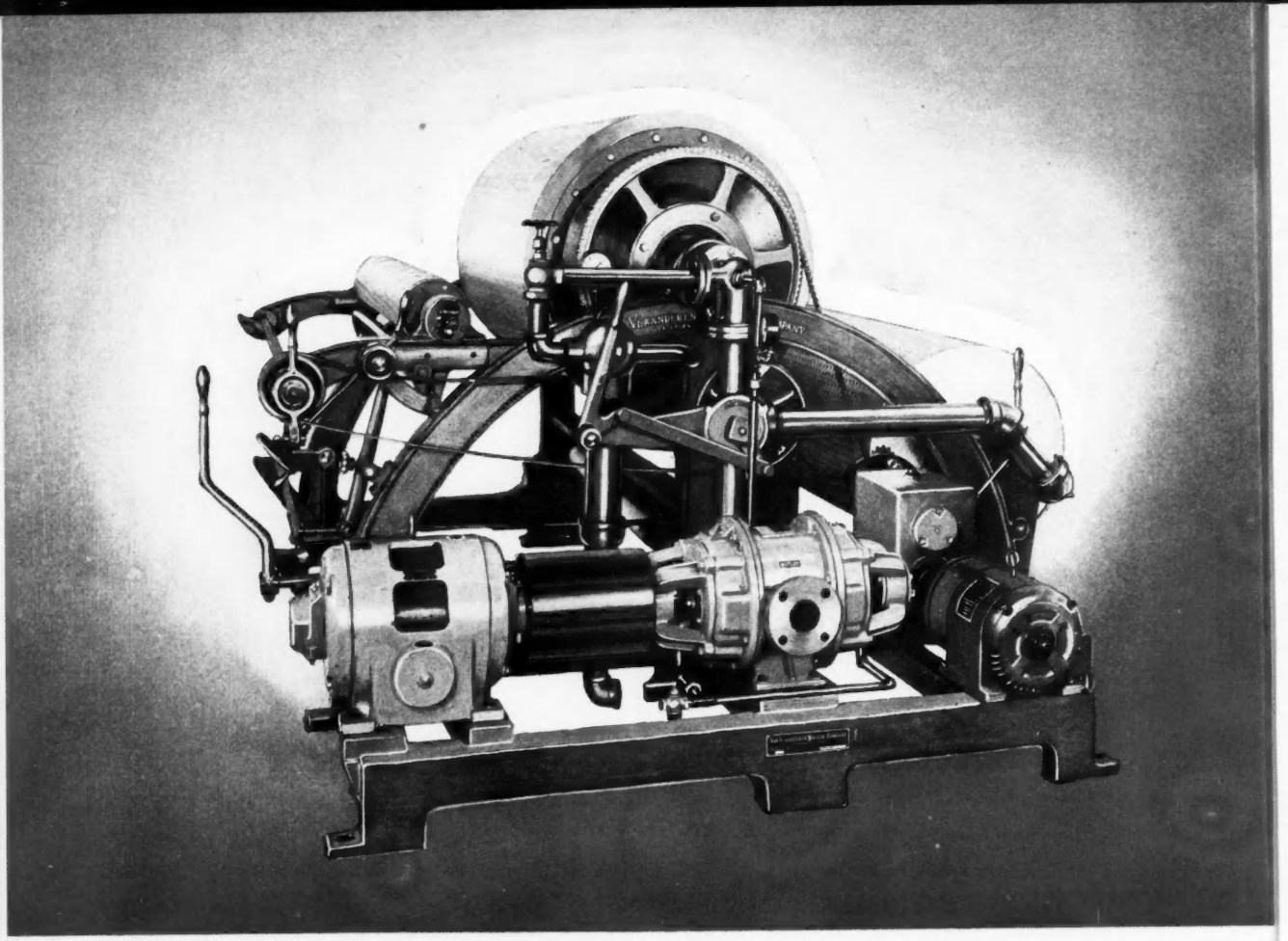
KELCO COMPANY

20 N. Wacker Drive
CHICAGO-6

31 Nassau Street
NEW YORK-5

530 W. Sixth Street
LOS ANGELES-14

Cable Address: KELCOALGIN—New York



DECATE MODERN FABRICS

TO CORRECT HARSH HANDLE, BREAKS, EXCESSIVE LUSTRE AND CLOUDY OR BLOTCHY DYEING

The conditioning machine shown above is well known to the trade. In many plants it has, for over ten years, been depended on to give that finishing touch to viscose and acetate rayon as well as to other fine fabrics, at a cost so low per yard that it need scarce be considered.

From time to time during the last few years we have made improvements to permit better production. For instance: faster take out speed, faster pick up speed and quicker brake action, faster removal of condensation and faster unloading speed.

The many new fabrics of man-made yarns that are now becoming available will also be greatly improved by decating. We will send, on request, an eight-page book giving decating information and a full description of the Van Vlaanderen Decater.

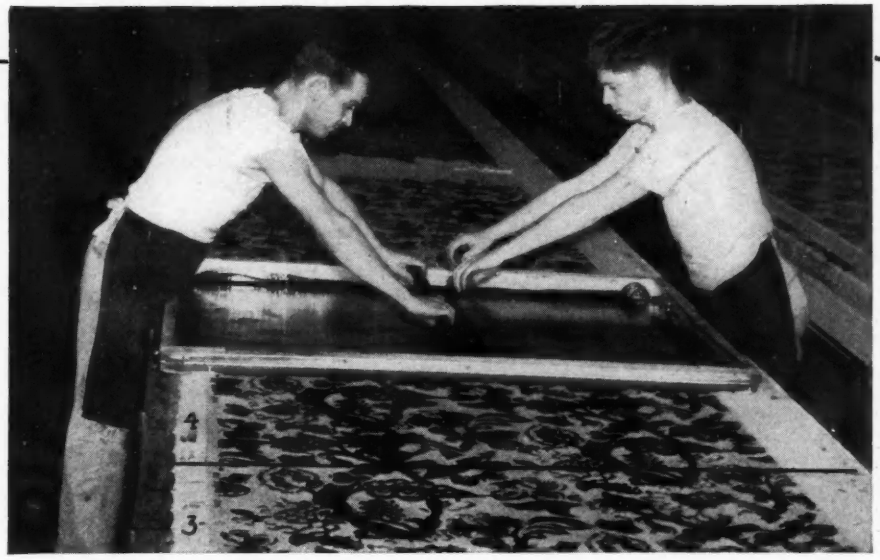
VAN VLAANDEREN MACHINE CO.

370 STRAIGHT STREET — PATERSON, NEW JERSEY

World's largest manufacturer of machinery for processing modern fabrics

New! Resyn*

TABLE ADHESIVE FOR SCREEN PRINTING



BARRET TEXTILE photo

Holds tightly! Releases cleanly!

NATIONAL'S quickly applied and reusable TABLE ADHESIVE holds unprinted cloth tightly to the screen table during the printing process. It replaces the tedious, time-consuming process of pinning.

NATIONAL'S TABLE ADHESIVE is a cold, liquid RESYN* adhesive that comes to you ready for use. It provides a light tack that prevents cloth slippage during printing . . . permits easy cloth removal after printing . . . and leaves the cloth clean and undamaged. In addition, it maintains a usable working tack for a period of several weeks. Ask for a trial demonstration in your plant.

National also produces: AMBERTEX a heavy-bodied thickener for white discharge, direct and vat color printing; FLOTEX to replace natural gums for printing; FIBERTEX for textile finishing; NALEX for cotton and worsted warp sizing; FLOJEL uniform, thin boiling corn starches in all standard fluidities; HOOSIER Pearl Cornstarch.

Offices: 270 Madison Avenue, New York 16; Boston, Philadelphia, Atlanta, New Orleans, Indianapolis, Chicago, San Francisco and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto and Montreal. In Holland: Nationale Zetmeelindustrie, N. V., Veendam.

(*Reg. Trade Mark)

National ADHESIVES

EVERY TYPE OF ADHESIVE FOR EVERY INDUSTRIAL USE

Vanesta

A *NEW* Starch Stabilizer

Stops Gelling

Improves Flow

Gives Uniform Consistency

Sample on request

R. T. VANDERBILT CO., INC.

230 Park Avenue, New York 17, N. Y.

With Color added—a wisp of net and a bolt of taffeta become Dame Fashion's latest creation; a drum of drab lacquer transmutes into eye-compelling nail enamel; a calfskin kip and a swatch of suede become Cinderella slippers... precious far beyond the value of such prosaic raw materials.

Such is the magic of Color in giving these materials dramatic, high-style value in consumer markets. Indeed the sales appeal of Color in modern merchandising is still in its infancy.

To capitalize the selling power of Color in the competitive days ahead, always specify National Aniline Dyes.

WHEREVER COLOR IS USED

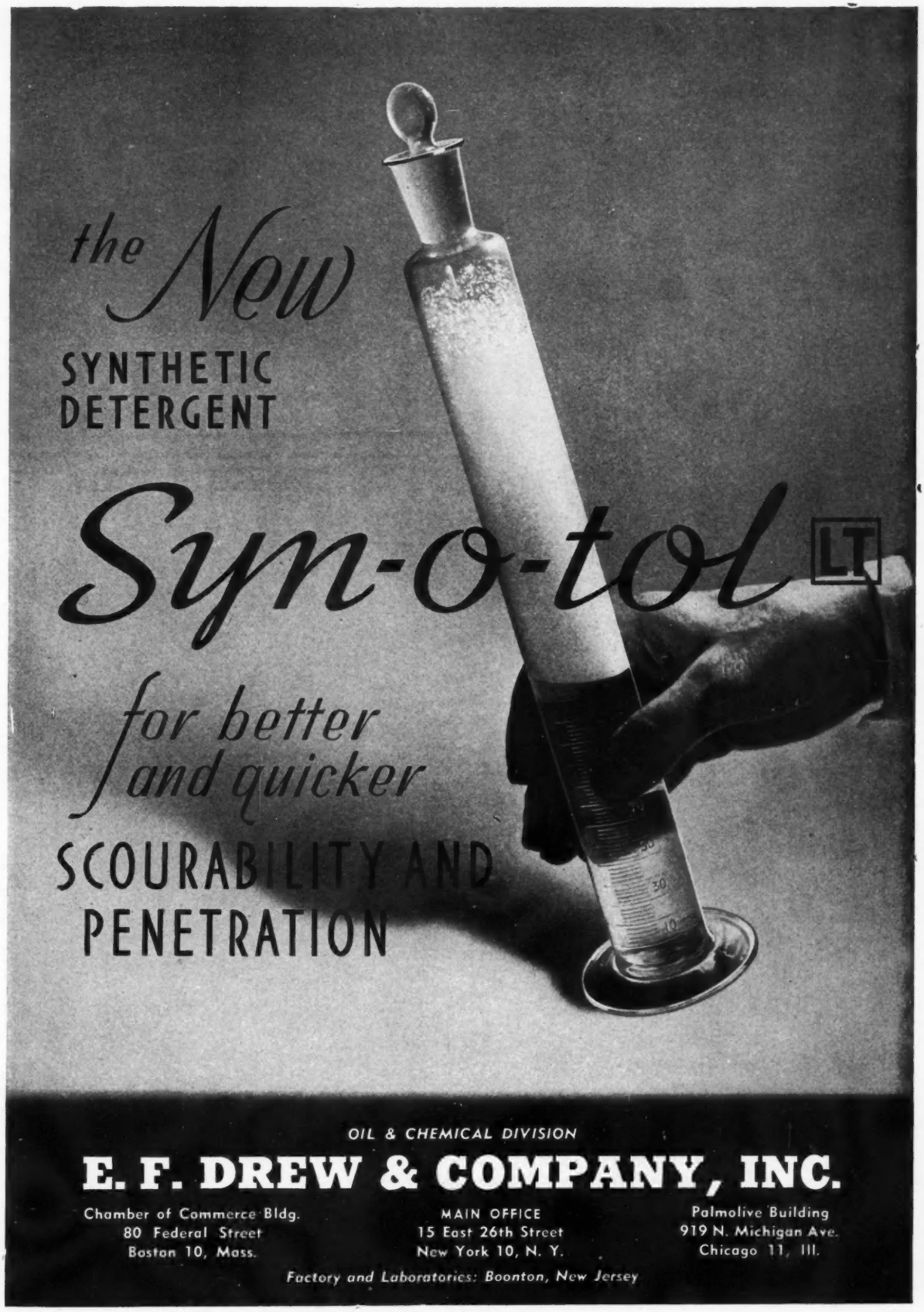
National Aniline

DIVISION OF

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET NEW YORK 6, N. Y.

BOSTON • CHICAGO
PROVIDENCE • PHILADELPHIA • SAN FRANCISCO • PORTLAND, ORE.
GREENSBORO • CHARLOTTE • ATLANTA • NEW ORLEANS • CHATTANOOGA • TORONTO


the New
SYNTHETIC
DETERGENT
Syn-o-tol LT
for better
and quicker
SCOURABILITY AND
PENETRATION
OIL & CHEMICAL DIVISION
E. F. DREW & COMPANY, INC.
Chamber of Commerce Bldg.
80 Federal Street
Boston 10, Mass.
MAIN OFFICE
15 East 26th Street
New York 10, N. Y.
Palmolive Building
919 N. Michigan Ave.
Chicago 11, Ill.
Factory and Laboratories: Boonton, New Jersey

teaching water new tricks

QUADRAFOS* produces higher quality, greater profits in textile processing

In at least 27 vital textile processes, QUADRAFOS teams up with water and other materials, like soap, dyestuffs, pigments, starches and bleaches, to offer you a profit-building degree of processing efficiency.

For example: if you're interested *in raw wool scouring,* you can get whiter, loftier stock with utmost soap economy; *in kier boiling of cotton,* a whiter, clearer bottom for bleaching or dyeing; *in rayon warp sizing,* a tougher, more flexible film on the yarn; *in linen boiling off,* removal of pectin substances without damaging the fiber; *in silk dyeing,* brighter shades and more level dyeing.

QUADRAFOS brings proven benefits to these and other steps in textile wet processing . . . benefits that add to higher quality and increased profits. For complete information on textile applications of QUADRAFOS write to Rumford Technical Service Department.

softens water without precipitation...deflocculates

...redissolves precipitates...promotes free rinsing

QUADRAFOS

*U. S. Reg. Trademark
for Sodium Tetraphosphate made by Rumford

RUMFORD CHEMICAL WORKS
20 Newman Avenue, Rumford 16, R. I.

NEUTRONYX 330

Non-Ionic • Surface-Active DETERGENT and EMULSIFIER with Unusual Dispersing Action

NEUTRONYX 330 offers exceptional usefulness in detergent, emulsifying and dispersing action with the outstanding advantage of stability against hardness, electrolytes and both anionic and cationic surface-active agents. It prevents redeposit of suspended soil on fabrics and does not adsorb on any textile fibers. It is particularly useful in improving penetration and levelling of acid, acetate and direct dyes. It is in extensive use as an assistant to insure more even exhaustion of anionic and cationic hosiery finishes.

Relatively non-foaming, Neutronyx 330 is an excellent wetting agent in warm solution.

PERFORMANCE

Surface Tension (Dynes per Cm.)
DuNouy Tensiometer (25°C.)

Concentration	Dynes
0.5%	34.5
0.1%	35.2
0.01%	35.4

Wetting Action (Draves Test)

Concentration	25°C.	60°C.
0.5%	215 Sec.	27 Sec.
0.2%	5 Min. Plus	56 Sec.
0.05%	"	170 Sec.

Detergency

Hunter Reflectometer with standard soiled cotton before and after washing.

Concentration	Per Cent
0.1%	13.5
0.05%	11.9

With addition of 0.25% TSPP

0.1%	22.8
0.5%	15.0

PROPERTIES

Neutronyx 330 is a reddish brown oily liquid readily miscible with water and with alcohol. It contains over 95% of the active ingredient – a polyalkyl ether condensate of fatty acids.

It is compatible with moderate concentrations of acids and alkalies and with hard water, electrolytes and both anionic and cationic surface-active agents. It disperses insoluble anionic-cationic complexes. Soluble in both water and organic solvents.

It is stable to heat and has perfect stability in both normal plant use and in storage.

OTHER USES

- Auxiliary Detergent for Hard Water Conditions
- Dispersing and Solubilizing Agent for Acetate Colors
- Scouring Assistant for Rayon and Acetate
- Assistant in Chlorination of Wool in Shrinkproofing
- Dispersing Agent for Pigments in Organic Vehicles

We will be glad to send complete data.

onyx

CHEMICALS FOR DYEING AND FINISHING

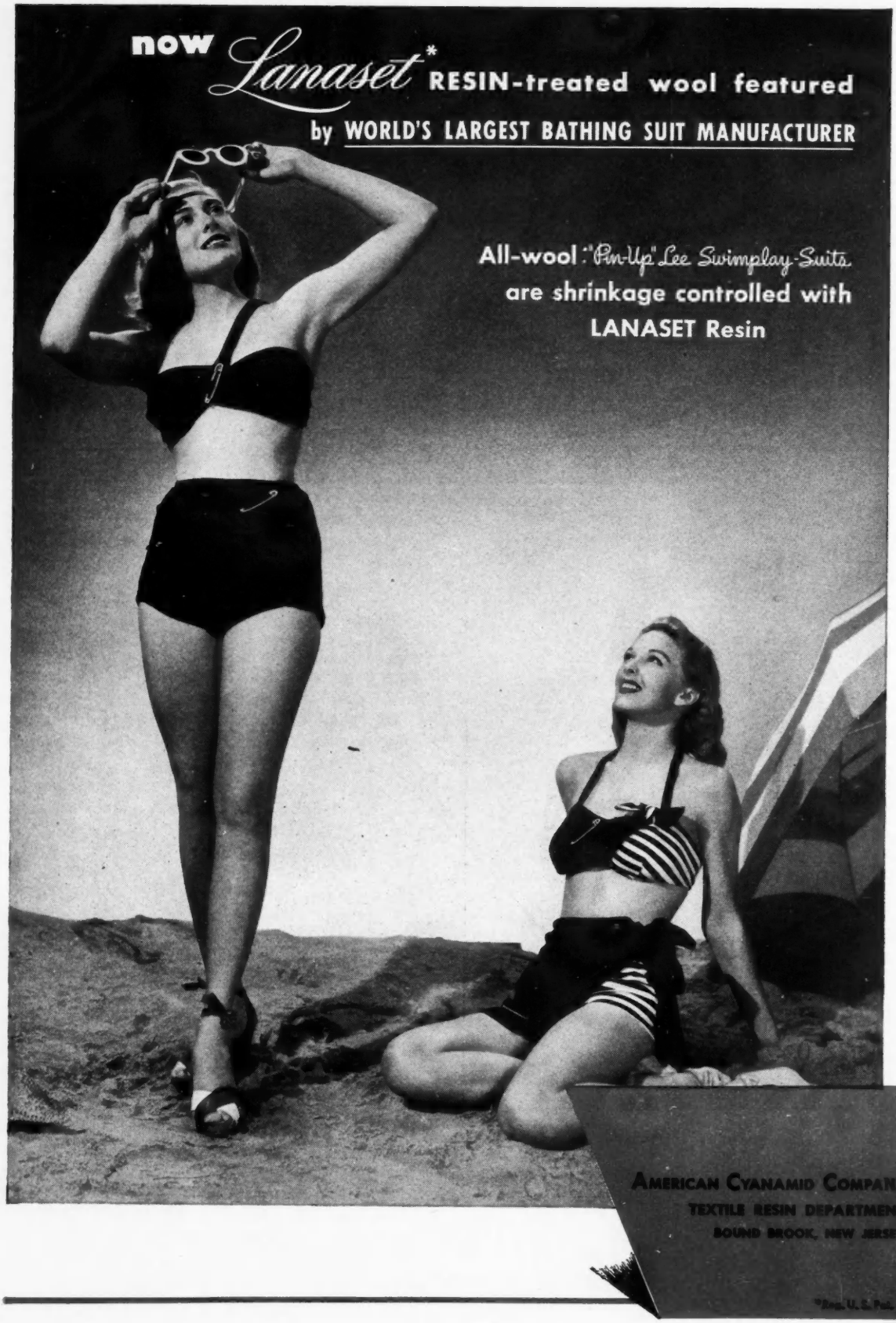
Onyx Oil & Chemical Company

JERSEY CITY 2, N. J.

CHICAGO • PROVIDENCE • CHARLOTTE • ATLANTA • LOS ANGELES

In Canada: Onyx Oil & Chemical Co., Ltd. Montreal, Toronto, St. Johns, Que.

For Export: Onyx International Jersey City 2, N. J.


now Lanaset* RESIN-treated wool featured
by WORLD'S LARGEST BATHING SUIT MANUFACTURER
All-wool "Pin-Up" Lee Swimplay-Suits
are shrinkage controlled with
LANASET Resin
AMERICAN CYANAMID COMPANY
TEXTILE RESIN DEPARTMENT
BOUND BROOK, NEW JERSEY
*Reg. U. S. Pat. Off.

THE SYMBOL OF TECHNICAL ACHIEVEMENT

VELVAMINE K-90

An improved softening and finishing agent for use on all types of fabrics. It imparts an odorless finish which is resistant to washing and dry cleaning. Can be used as a substitute for sulphonated oils, tallows and other softeners. Its use eliminates yellowing and rancidity often encountered with the usual fatty type of softening agents.

PERMALENE WS

A white powder soluble in water at 80° F. Capable of dispersing iron, calcium and magnesium salts and redissolving or re-dispersing precipitated compounds of these metals. It is so highly buffered that the pH of its solution is practically independent of its concentration.

PERMALENE SOL

A penetrant and cleanser designed for use on all fabrics especially those that are tightly woven and highly twisted. Recommended for pad-dyeing where it insures uniform and thorough penetration. It is of great assistance where low temperature dyeings are necessary. Non-foaming at high speeds, it is stable in neutral, alkaline and acid solutions.

VELVAMINE GF

Velvamine GF is a blend of amines and softeners designed to protect acetate colors from gas or fume fading. It resists removal by drycleaning and, when used on mixed fabrics, has a minimum effect on the shade and light fastness of the direct colors. Velvamine GF produces a soft, full hand and does not affect the appearance of the treated fabrics.

REFINED PRODUCTS CORPORATION

LYNDHURST • NEW JERSEY

*Manufacturers of PERMA-CIDE, the approved, outstanding, mildew-proofing agent

Southern Representative: DYER S. MOSS, 1301 Liberty Life Bldg., Charlotte, North Carolina

New England Representatives: E. L. LEGG, P. O. Box 597, Providence, R. I.
CLARENCE E. MOSS, 19 Wilson Ave., Rumford (16) R. I.

Canadian Selling Agents: Berkeley Products Canada, Ltd., 41 Hillcrest Avenue, St. Catharines, Ontario, Canada ◆ Exporting Agent: Chem-Cel Company, 82 Wall St., New York City

Brightness and Economy are Characteristics of

Pharmasol Golden Yellow N

PHARMASOL Golden Yellow N produces clear, bright, fast and economical golden yellow shades when printed on cottons or rayons.

When mixed with Pharmasol Red RN, a complete range of Gold Shades can be obtained.

PHARMASOLS are solutions of stabilized azoic dyes and adjusted to the most practical concentration which can be easily applied with a maximum of efficiency.

PHARMASOLS solve the problem of troublesome dissolving and the uncertainties thereof—and as there is no decomposition there can be no loss of material or value.

Wide Range of use is Big Feature of

Indigosol Golden Yellow IGK

THE present price of Indigosol Golden Yellow IGK makes possible the use of this very fast Indigosol for economical dyeing and printing operations.

In combination with Indigosol Green IBA, very fast green shades are now available to the printer and dyer for the first time at a very reasonable cost.

An excellent printing color on cotton and rayon, it is also of great interest to the dyer of cotton, rayon and wool.

In ease of application, the perfectly level shades obtained, and the unusually excellent penetration of heavy goods makes the entire line of INDIGOSOLS especially valuable to the fast color dyer or printer.

CARBIC COLOR AND CHEMICAL CO., INC.

451-453 Washington Street, New York City

BRANCHES:
PHILADELPHIA
PROVIDENCE HAMILTON, ONT.
CHARLOTTE, N. C.

IMPORTERS OF THE MANUFACTURES OF
DURAND & HUGUENIN S. A.
BASLE, SWITZERLAND

EXCLUSIVE DISTRIBUTORS OF
PHARMASOLS
PHARMOLS
PHARMACINES

Representative: Los Angeles (Hathaway Allied Products)

AMERICAN DYESTUFF REPORTER

LOUIS A. OLNEY, D.Sc.
Directing Editor

NORMAN A. JOHNSON, B.T.C.
Managing Editor

MYRON D. REESER
Advertising Manager

GRACE B. BURTON
Production Manager

M. H. MORGAN
Circulation Manager

Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

Published every other Monday by
HOWES PUBLISHING COMPANY, INC.
One Madison Avenue, New York 10, N. Y.

A. P. HOWES
President

C. R. HOWES
Vice President

H. F. CRAWFORD
Treasurer

M. D. REESER
Secretary

C. ESSENBREIS
Asst. Secretary

Also Publishers of
KNIT GOODS WEEKLY
TEXTILE COLORIST
AND CONVERTER

MARCH 24, 1947

VOLUME 36 NUMBER 6

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Departments

Patent Digest 153
Paul Wengraf

Trade Notes—New Products 156

• Proceedings of the American Association of Textile Chemists and Colorists

February Meeting, Rhode Island Section P134

March Meeting, New York Section P134

Calendar of Coming Events P134

Composition and Function of Flame-Resistant Treatments for Textiles P135
Robert W. Little

Testing for Fire Resistance P140
James R. Redmond

Flammability of Wearing Apparel P141
Herman E. Hager

Intersectional Contest:

An Evaluation of the Kupensaure Process P142
Piedmont Section

Meeting Dates, Philadelphia Section P149

Moiré Finishing of Today's Fabrics P150
Hans A. Holterhoff

Winter Meeting, Piedmont Section P152

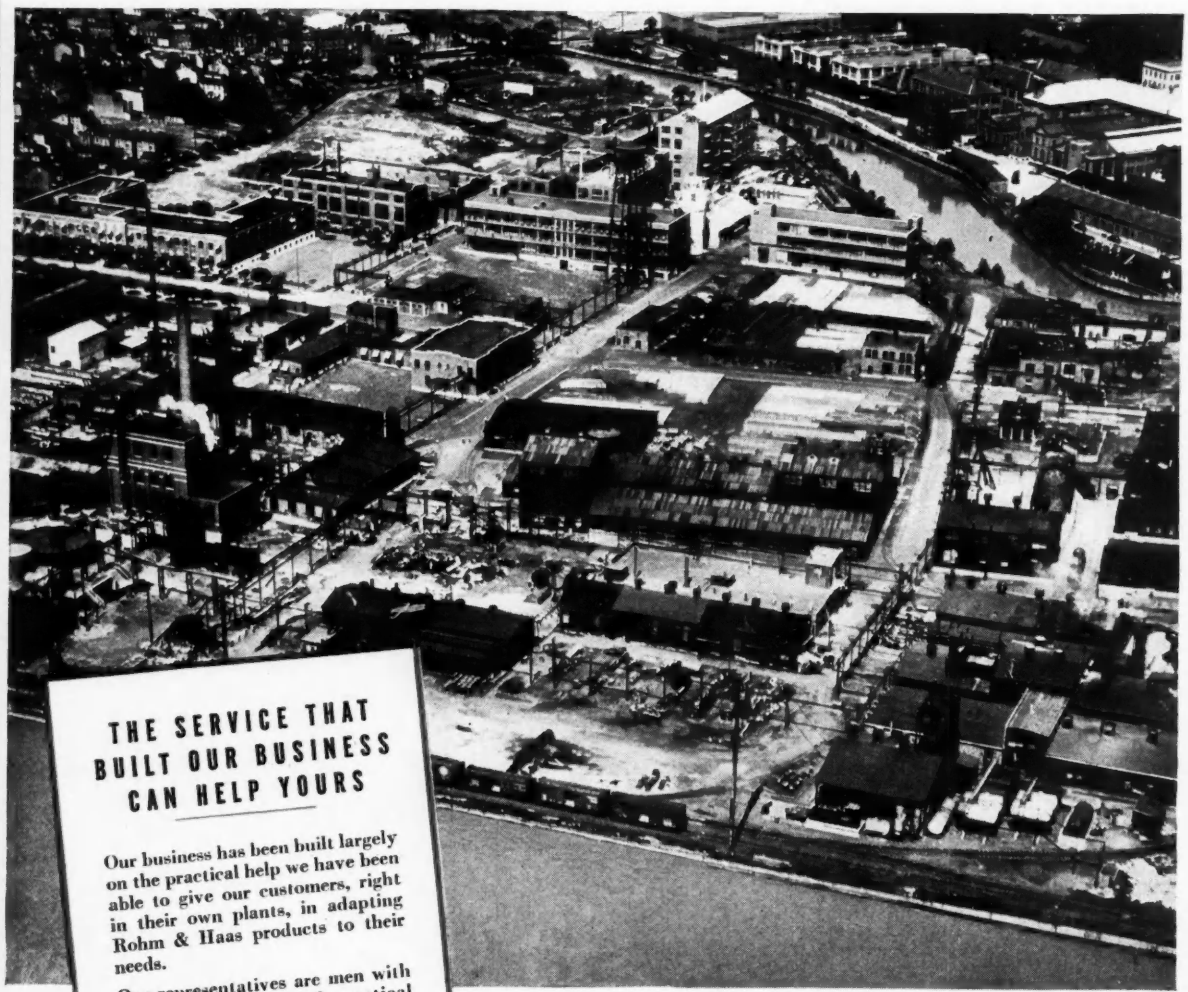
North Carolina State College Student Chapter Meeting P152

Employment Register P152

Copyright, 1947, Howes Publishing Co., Inc.

Where TRITONS and RHONITES are made...

along with other reliable Textile Chemicals



THE SERVICE THAT BUILT OUR BUSINESS CAN HELP YOURS

Our business has been built largely on the practical help we have been able to give our customers, right in their own plants, in adapting Rohm & Haas products to their needs.

Our representatives are men with technical training and practical experience in the use of industrial chemicals. Call in a member of our textile chemicals department when you need assistance in choosing or using . . .

Chemicals For Fine Textiles

TRITONS... Surface active agents for increasing textile wet strength efficiency. A TRITON for every purpose.

RHONITES... Urea formaldehyde condensates—the first American textile resins offered commercially for crease-resistant fabrics.

TRITON *and* RHONITE *are trade-marks, Reg. U. S. Pat. Off.*

Represented in Canada by Rohm & Haas Company of Canada, Ltd., Toronto; and in South America by Cia. Rohm y Haas, S. R. L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Plastics • Synthetic Insecticides • Fungicides • Enzymes • Detergents
Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and other Industries

Proceedings of the
American Association of Textile Chemists and Colorists

MARCH 24, 1947

National Officers of the Association

President
HENRY F. HERRMANN
General Dyestuff Corp., 435 Hudson Street, New York 14, N. Y.

Vice-Presidents
C. NORRIS RABOLD
Union Bleachery, Greenville, S. C.
JOHN N. DALTON
Pacific Mills, Lawrence, Mass

Treasurer
WILLIAM R. MOORHOUSE
National Aniline Division, Allied Chemical & Dye Corp., 150 Causeway Street, Boston 14, Mass.

Secretary
HAROLD C. CHAPIN
Lowell Textile Institute, Lowell, Mass.

President Emeritus and Chairman of the Research Committee
LOUIS A. OLNEY
Lowell Textile Institute, Lowell, Mass.

Director of Research
HAROLD W. STIEGLER
Lowell Textile Institute, Lowell, Mass.

COUNCILORS
Representing Sections

Rhode Island: HOWARD V. KING, HAROLD B. STURTEVANT, RALPH F. CULVER.

Philadelphia: CURT R. BAERINGER, LLOYD O. KOONS, ARTHUR W. ETCHELLS, BOYCE C. BOND, PERCIVAL THEEL.

New York: PATRICK J. KENNEDY, LEONARD S. LITTLE, THOMAS F. O'BRIEN, GEORGE L. BAXTER, EMMETT J. DRISCOLL, WINN W. CHASE, HAROLD H. TAYLOR.

Northern New England: EDWARD S. CHAPIN, WALTER J. HAMBURGER, DELBERT E. RAY.

Piedmont: SIDNEY M. CONE, RAPHAEL E. RUPP, LELAND G. ATKINS.

Southeastern: WILLIAM B. GRIFFIN.

South Central: WILLIAM E. REID

Mid-West: ERIC W. CAMP, SAMUEL KLEIN.

Past Presidents

ELVIN H. KILLHEFFER, P. J. WOOD, WILLIAM H. CADY, ALBAN EAVENSON, CARL Z. DRAVES, THOMAS R. SMITH, WILLIAM D. APPEL.

Standing Committees of the Council and their Chairmen

Executive Committee on Research
J. Robert Bonnar, Chairman

Publicity
Winn W. Chase, Chairman

Appropriations
William R. Moorhouse, Chairman

Constitution and By-Laws
Harold C. Chapin, Chairman

Corporate Memberships
Henry F. Herrmann, Chairman

Publications
Louis A. Olney, Chairman

Local Sections and their Officers

Northern New England Section

Chairman
George O. Linberg, Monsanto Chemical Co., 140 Federal Street, Boston 10, Mass.

Secretary
Azel W. Mack, Dexter Chemical Corp., 581 Boylston Street, Boston 16, Mass.

Vice-Chairman: Frank J. O'Neil
Treasurer: Martin H. Gurley, Jr.

Rhode Island Section

Chairman
George H. Wood, Jr., 40 Valentine Circle, Apponaug, R. I.

Secretary
Emory A. Richards, Airedale Worsted Mills, Inc., 928 Park Ave., Woonsocket, R. I.

Vice-Chairman: Robert W. Joerger
Treasurer: Robert F. Farwell

New York Section

Chairman
Herman E. Hager, General Dyestuff Corp., 435 Hudson Street, New York 14, N. Y.

Secretary
Norman A. Johnson, American Dyestuff Reporter, One Madison Ave., New York 10, N. Y.

Vice-Chairman: Charles W. Dorn
Treasurer: John H. Hennessey

Philadelphia Section

Chairman
Walter Fancourt III, W. F. Fancourt & Co., 516 S. Delaware Ave., Philadelphia 47, Pa.

Secretary
A. E. Raimo, John Campbell & Co., S. E. Corner Broad and Spring Garden Sts., Philadelphia 23, Pa.

Vice-Chairman: Arthur M. Gordon
Treasurer: James Dixon

Piedmont Section

Chairman
Wyss L. Barker, National Aniline Division, Allied Chemical & Dye Corp., P. O. Box 659, Charlotte 1, N. C.

Secretary
Robert H. Smith, Melrose Hosiery Mills, High Point, N. C.

Vice-Chairman: John B. Neely
Treasurer: Roy J. Beauregard

South Central Section

Chairman
Jack Anderson, Peerless Woolen Mills, Rossville, Ga.

Secretary
Charles A. Spratt, National Aniline Division, Allied Chemical & Dye Corp., Chattanooga, Tenn.

Vice-Chairman: William J. Kelly
Treasurer: Robert J. Quigg

Mid-West Section

Chairman
Al. J. Feit, E. I. duPont de Nemours & Co., Inc., 7 S. Dearborn Street, Chicago, Ill.

Secretary
George B. Chabot, Jr., Calco Chemical Division, American Cyanamid Co., 146 W. Kinzie Street, Chicago, Ill.

Vice-Chairman: George E. Osha
Treasurer: Joseph H. Jones

Southeastern Section

Chairman
A. Kempton Haynes, Rohm & Haas Co., Inc., 1811 Meadowdale Ave., N. E., Atlanta, Ga.

Secretary
Howard M. Waddle, West Point Mfg. Co., Shawmut, Ala.

Vice-Chairman: Matthew T. Barnhill
Treasurer: Allyn J. Morse

Student Chapters

Lowell Textile Institute
North Carolina State College
Philadelphia Textile Institute
New Bedford Textile Institute
Georgia School of Technology

Members should notify the Secretary immediately of all address changes

February Meeting, Rhode Island Section

THE February 28th meeting of the Rhode Island Section of the AATCC was a dinner meeting held at Johnston's Grill. Approximately 200 were present for the dinner with 50—75 more coming in for the technical session.

This meeting was devoted to flameproofing. The following papers were presented:

A. "Flameproofing Agents for Textiles" Dr. Robert W. Little, Ellicott Laboratories, discussed the theory of flameproofing agents and the various ways of applying them.

B. "Evaluation of Flameproofing Agents" James Redmond, Chairman of AATCC Committee on Flameproofing. Mr. Redmond's paper dealt with the work now being done by his committee to properly and efficiently evaluate flameproofed textiles.

C. "Flammability of Wearing Apparel" Dr. H. E. Hager, Chairman of Consumer Div. of AATCC committee on Flameproofing. Dr. Hager traced the history of his committee and its relationship to properly safeguard the public from the ravages of fire caused by inflammable textiles.

D. C. A. Baker of the U. S. Testing Co. demonstrated the AATCC Testing Machine for Flameproofing.

Along with Mr. Redmond's talk a film on flame proofing was shown. This film was made available thru the courtesy of the Philadelphia Textile Finishers.

Respectively submitted,

E. A. RICHARDS,

Secretary

—♦ ♦—

March Meeting, New York Section

THE last meeting of the New York Section was held at the Swiss Chalet, Rochelle Park, N. J., on March 7th. An informal dinner preceded the meeting.

The chairman, Dr. Herman E. Hager, reported that 250 replies had been returned on the questionnaire postal card that had been sent out to the members regarding future meeting places. He stated that preferences so far would indicate that next year at least two winter meetings would be held in New York: a dinner meeting at a hotel and one, or possibly two, meetings at the Engineering Society Hall. The final results on the questionnaire will be announced at the next meeting to be held at the Swiss Chalet on May 2nd.

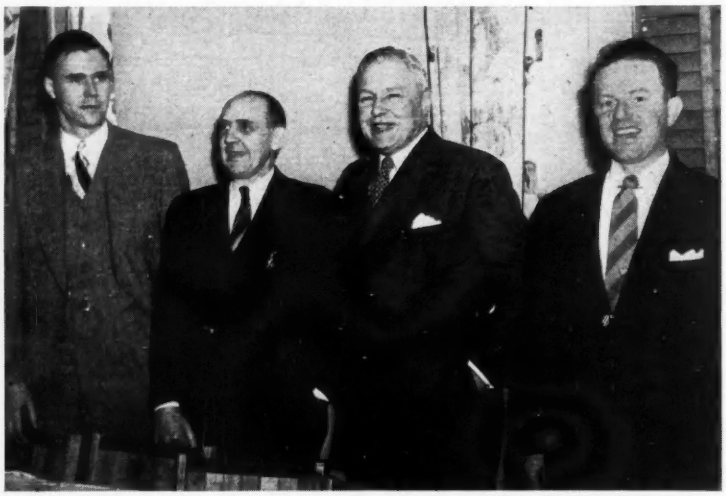


Photo by Kenneth C. Everett

PRESENT AT THE MEETING OF THE RHODE ISLAND SECTION ON FEBRUARY 28TH: Left to right —Dr. Robert W. Little, Ellicott Laboratories; George H. Wood, Jr., Apponaug Co. (Chairman of Rhode Island Section); Dr. Herman E. Hager, General Dyestuff Corp.; James R. Redmond, Interchemical Corp.

The chairman also announced that the annual outing and golf tournament would be held on Friday June 20th at the North Jersey Country Club.

The chairman further reported that a research committee of the New York Section had been formed and had held their first meeting on the afternoon on March 7th. The personnel of this committee is as follows: Dr. E. W. K. Schwarz, Chairman; Herman P. Baumann, Secretary; Harold H. Taylor, Theodore Scheuermann, William Holst and Henry E. Millson. The first task of the committee is to select a suitable subject for the Intersectional Contest which will be held at the National Convention in Chicago in October.

Henry E. Millson presented the New York Section paper which won first prize in the Intersectional Contest held at the Silver Jubilee Convention in Boston last December. The title of this paper is "Tippy Dyeing of Wool and its Control." The paper was illustrated with a number of slides in full color.

S. H. Williams, resident manager of General Dyestuff Corp., in Charlotte, N. C., presented a paper on "The Williams Unit: Its Use in Textile Processing".

A discussion period followed the presentation of these papers.

The attendance was over 400.

Respectfully submitted,

NORMAN A. JOHNSON,

Secretary

CALENDAR

NEW YORK SECTION
Meeting: May 2 (Swiss Chalet, Rochelle Park, N. J.)
Outing: June 20. (North Jersey Country Club).

RHODE ISLAND SECTION
Meetings: March 28, April 25.

PHILADELPHIA SECTION
Meetings: April 11, May 23.

NORTHERN NEW ENGLAND SECTION
Meetings: April 25, 25, May 16, September 26, November 21.
Outing: June 13.

SOUTH CENTRAL SECTION
Meeting: April 12. (Patten Hotel, Chattanooga).
[3:00 P.M.—Henry E. Millson, "Dyeing and Handling of Wool." 7:00 P.M.—Dinner: Speaker to be announced.]

PIEDMONT SECTION
Meeting: April 12. (O. Henry Hotel, Greensboro, N. C.)
Outing: June 20 and 21. (Ocean Forest Hotel. Myrtle Beach, S. C.)

MID-WEST SECTION
Meeting: April 12. (Schroeder Hotel, Milwaukee, Wis.)
Outing: June 21. (Lake Lawn, Delavan, Wis.)

SOUTHEASTERN SECTION
Meeting: June 7. (Atlanta, Ga.)

NATIONAL CONVENTION
October 23, 24, 25. (Congress Hotel, Chicago, Ill.)

Composition and Function of Flame-Resistant Treatments for Textiles*

DR. ROBERT W. LITTLE
Ellicott Laboratories

WITHIN the past two to three years applications of flameproofing treatments to textile fabrics have expanded rapidly both with respect to the types of fabrics considered and the various end uses for which the treated materials are intended. The differences in the flame-resistant characteristics desired has led to considerable confusion and misunderstanding regarding the terminology employed in the trade and technical literature. I should like to take a few moments to discuss some of the terms specific for flameproofing applications.

The quantitative estimation of the effectiveness of a flameproofed fabric is generally accomplished by means of a selected test procedure, expressing the results in terms of afterflaming, afterglow and char area or char length.

Afterflaming may be simply defined as "the continuation of flaming of a material after the source of ignition has been removed." It is generally expressed quantitatively in terms of the duration of afterflaming in seconds.

Similarly, *afterglow* is "the continuation of an active glow after all flaming has ceased." This, too, is expressed in terms of the duration of the glowing reaction in seconds.

The *char dimensions* are defined as "the length or area of material thermally degraded during the flaming and glowing reactions." Depending upon the testing procedure employed, this characteristic is expressed in terms of *char length* in inches or *char area* in square inches.

Considerable latitude has been allowed in the classification of a substance as a *flameproofing agent*. True, any non-combustible material will influence burning characteristics when present in sufficient quantity. The term flameproofing agent should properly be restricted, however, to those materials "which when present in relatively small amount will appreciably reduce afterflaming, afterglow, and char dimensions."

The greatest current misunderstanding of terminology is in the classification of fabrics in terms of their relative resistances to burning. Such varied expressions as fire-resistant, fire-retardant, flame-resistant, flame-retardant, flameproof and fireproof have been employed at one time or another. The following are the more acceptable members of this group and suffice to define all of the many applications now in practice.

A *flame-resistant* or *flame-retardant* fabric is one which "exhibits appreciable resistance to afterflaming." This classification should correctly be restricted to untreated fibers or fabrics showing high natural resistance to afterflaming or to treated fabrics which exhibit considerably less afterflaming than the untreated material. A more-or-less absolute definition could be made in terms of the performance shown under standard conditions of test.

In like manner, a *glow-resistant* or *glow-retardant* fabric would "show appreciable resistance to afterglow." The application of this term is identical with the preceding one, recognizing that the phenomena of afterflaming and afterglowing are two independent and unrelated reactions.

A *flameproof* fabric might be ideally defined as a material "showing no afterflame or afterglow." Practically speaking, however, it must be defined in terms of a standard testing procedure. In terms of the vertical-Bunsen burner flame test, which is probably most widely employed at the present time, a flameproof fabric has been defined as "showing no afterflaming, no afterglow beyond the original charred area, and a char length of from 3.5 to 7.5 inches depending upon the weight and weave of the greige fabric." The allowable char length must be based in each case on the particular fabric in question. It would be foolhardy to expect equal char dimensions with an 8 ounce drill and a 1 ounce marquisette. One important criterion exists to differentiate flameproof materials from those which may be described as fireproof; i.e. a flameproof fabric is thermally degraded wherever in contact with a source of high temperature or flame.

Correspondingly, *fireproof* denotes the ability to "withstand exposure to flame or high temperature and still perform the function for which originally intended." The material is not thermally degraded at ordinary flame temperatures. Since the characteristic of thermal degradation is inherent in cellulose and other natural or synthetic fibers, there can be no fireproof fabrics in the ordinary sense. Possible exceptions would be those constructed of glass or asbestos fibres.

Testing Procedures

In tempo with the rapidly expanding applications of flameproof and flame-resistant finishes in the field of textiles has been the development of testing procedures for the evaluation of treated fabrics. Here, too, considerable misunderstanding has developed regarding the burning characteristics to be tested in each case and the proper test procedure for the purpose.

In drawing up specifications or regulations governing the performance of flameproof or slow-burning fabrics the primary consideration should be as to just what property of the fabric is of greatest importance. The fabric characteristics to be considered are: (1) the ease of ignition or "flammability"; (2) the rate of burning or "combustibility", and (3) the resistance to flame and thermal degradation or "flameproofness." There are several testing procedures available at the present time which are adaptable to the measurement of these characteristics. If properly designed, however, they are applicable to only one of the properties under consideration and are wholly unsuited for estimation of the other two. In brief, the following are a few of the better known test methods currently in use, indicating the application for which they are suited.

Two methods have been developed for

* Presented at meeting, Rhode Island Section, February 28, 1947.

measurement of "flammability" or ease of ignition. Perhaps it would be more accurate to say they are a measure of the resistance of a material to ignition. The first of these, the number two test of the California Safety Standards for the fire resistance of wearing apparel, is probably the only widely known testing procedure which is solely concerned with the resistance to ignition. In essence, the technique determines the time in seconds which will elapse before the material bursts into flame when exposed to the radiant heat of an incandescent wire at a specified distance from the element. There are some indications that this procedure is unduly severe. In some instances, flashing has occurred in less than the prescribed five seconds with non-burning fabrics which pass the most severe test for flameproofness. The other testing procedure considered applicable as a measure of resistance to ignition is the 45° "Flammability" test of the AATCC. In this case the test results represent a combination of the resistance to ignition and the rate at which the material burns once ignited. The fact that the test specimen is only six inches in length makes the property of resistance to ignition the predominant one of the two. This can be shown by relative rate of burning measurements on two fabrics, one of which passes the AATCC test and the other which fails.

Turning to the rate at which a fabric burns once ignited, many quite different test procedures present themselves. The number one test of the California Standards for wearing apparel is carefully designed to measure only the speed with which a fabric burns. The only disadvantage of the test as practiced is the question of whether valid burning rates can be determined in the burning of a six inch length of material. Data obtained with much longer specimens would indicate that the accuracy and precision of such a rate-of-burning measurement would be doubtful. The AATCC "Flammability" test is very similar both with respect to the apparatus and testing procedure employed. The major difference, as pointed out above, is that the AATCC test includes the property of resistance to ignition in the timing period. The Army Quartermaster Corps has a "Flammability" test which is similar to the preceding two in some respects. The specimen is also six inches long though there are differences in the apparatus, source of ignition and method of expressing data. Furthermore, the angle of inclination is 30° to the horizontal. The horizontal rate-of-burning test devised by the U. S. Bureau of Standards is perhaps better suited to measurement of the rate at which burning progresses. The twelve inch specimen is held in a horizontal position and, once ignition has been well started, the time required for the flame to progress ten inches is noted and expressed in terms of the burning rate in inches per minute. One remaining test which should be included in this group is the "Flame-rate" test as employed by the Quartermaster flameproofing project. In this case the test specimens were 2 inches wide and 36 inches long. Flame-rate measurements were made at varying angular deviations from the horizontal. The inclination yielding the best spread of results was found to be 30° to the horizontal. Marking off the specimen at five inch intervals, the rate of burning was observed for each five inch section, disregarding the first and last segments. A simple plot of time versus distance permits securing a fairly accurate measure of burning rate in inches per second. The accuracy of such a measurement is indicated by the fact that ordinary commercial sizes noticeably reduced the burning rate of a fabric. The extreme variability encountered in the different 5-inch sections, however, raises the question as to whether the 6-inch length employed in some of the foregoing tests can be expected to yield a valid burning rate measurement.

The last group of burning tests available are those for the testing of flameproof fabrics. These are intended to measure the resistance of non-burning fabrics to flame and thermal degradation. In brief, the specimen is actually inserted into a flame for a 12-second period, the igniting source then removed and notation made of the time of afterflaming, time of afterglow and char dimensions. In the case of the vertical-Bunsen test, which is probably most commonly employed at present, a 2 x 12 inch specimen is suspended vertically into a luminous burner flame. Similar tests have been developed, where the flame is impinged on the lower surface of a square specimen when suspended horizontally or at an angle of 45°.

The point which I would like to make is that these various groups of tests are tailor-made for a specific purpose and should not be employed for measuring all flame-resistant characteristics. Obviously, ease-of-ignition or rate-of-burning tests are not applicable to flameproofed fabrics which will not burn. Similarly, flame-resistant fabrics of the type currently being considered in the field of wearables will all be totally consumed when subjected to one of the tests designed for flameproof fabrics. Recognition of the performance characteristics desired for a particular end-use and the testing procedure adaptable to the measurement of those characteristics, will greatly simplify the selection of a proper flame-resistant or flameproof finish.

Theories of Flameproofing

Regardless of its chemical nature or method of functioning the over-all requirement for a flameproofing agent is that it shall be intimately mixed with the fibers and be capable of performing its function at the time that the material reaches flame temperatures. In most instances, the actual retardant component cannot be affixed to the fabric due to its volatility or to the degrading effect which it will exert. This is understandable, since the actual active ingredient in most cases is a strongly acid or strongly alkaline residue which depends for its effectiveness on the very reactions which lead to the degradation of the fabric. For this reason, the retardant must be a compound or mixture which can be linked or bound to the fibers and which will release the desired flame-resisting substances at the moment that flaming temperatures are reached. It is essential that these same corrosive materials are not released in any appreciable quantities under ordinary conditions. In general, the effectiveness of any flameproofing compound can be related to the extent to which the active components are released at the proper time and at the proper place in the fiber.

In looking into the mechanisms of flameproofing reactions, two distinct effects of the retardant compound are observed. I should like to discuss first what might be termed the secondary effects of flameproofing action, namely, the influence of the retardant on the thermal degradation products of cellulose.

When thermally degraded at high temperatures, cellulose breaks down into three major phases; a solid char, a volatile liquid of tarry nature, and a gaseous fraction. It would seem that the occurrence of a flaming reaction would be dependent upon the relative amounts of these phases formed and perhaps the rates of formation. Such has been shown to be the case.

Since flaming is essentially the rapid oxidation of a combustile vapor, effective flameproofing should be accomplished by retaining the degradation products in the solid phase. The ideal case would then be represented by the reaction:

$$(C_6H_{10}O_5)_n \rightarrow 6n\ C + 5n\ H_2O.$$

Actually, the addition of a flameproofing agent to cellulose greatly increases the amount of char formed on thermal degradation. Furthermore, the effect has been clearly shown to be proportional to the actual flameproofing efficiency of the retardant added.

It might be assumed that the gases re-

sulting from the thermal degradation of cellulose play a major part in the flaming reaction. Such is not the case. The addition of 5 to 10 per cent of an efficient flameproofing material does approximately double both the amount of gaseous products formed and their rate of formation. The effect is not specific for flameproofing salts, however, sodium chloride being nearly equally effective. The dry gases evolved are approximately 35 per cent soluble organic constituents, 35 per cent CO, 15 per cent hydrocarbons and 15 per cent CO_2. Carbon dioxide is the only non-flammable constitutent and the amount present remains essentially constant. The over-all effect, therefore, is that the dry gases do not vary in flammability but do increase in amount and in rate of formation. The fact that this effect is not specific for flame-retarding materials prevents consideration of the dry gas phase as a major factor in flameproofing reactions.

Probably most closely related to the phenomenon of afterflaming are the volatile, tarry degradation products. It can be demonstrated that the dry tars formed from the thermal degradation of cellulose are quite flammable and burn vigorously. The principal function of a retardant would thus seem to be the reduction of these combustible products. Absorbent cotton, when properly pyrolyzed in the absence of oxygen, yields approximately 55 per cent dry tars on the basis of the weight of original cotton. In the case of fabrics, this figure is somewhat lower, in the region of 40 per cent. The addition of 5 to 10 per cent of an efficient retardant reduces the quantity of tar formation to 5 per cent. Non-retardants, such as sodium and potassium chloride, are incapable of reducing tar formation below 30 per cent even when present in relatively high add-ons. This effect, therefore, is quite parallel to the flameproofing efficiency of the material added. It has been shown that, for a fabric to exhibit no afterflaming, the tar formation must be less than 2 mgs per sq. cm. of fabric. In the range of 2 to 4 mgs per sq. cm., afterflaming of 10 to 20 seconds will occur in the vertical-Bunsen flame test, while with yields greater than 4 mgs. per sq. cm. a self-sustaining combustion results. The secondary effect of the retardant on degradation products then is a reduction in the amount of combustible tarry products and a corresponding increase in the amount of solid char formed. This is in agreement with the ideal reaction mentioned previously. One more factor which must be considered, however, is the amount of water formed as indicated in that same reaction. When actually evolved, the tarry products are accompanied by appreciable quantities of water. At the same time that the amount of dry tar is reduced as a result of the retardant action, the amount of water evolved is appreciably increased. Therefore, the effectiveness is due not only to a reduction of fuel supply but also to a dilution of the combustible vapors with water. It was deemed possible that part of the effects shown were attributable to differences in the chemical composition of the tarry products. Studies of the chemical and physical characteristics of these products however, showed no variations in composition which would contribute appreciably to the observed differences in performance.

Bearing in mind these so-called secondary effects of flameproofing agents, it is now possible to consider the primary effects or causes of flameproofing action. In most instances the following discussions are based less upon facts and more upon speculation than in the preceding instances.

Many theories have been proposed to explain the phenomenon of flame resistance. Some are much more firmly based on experimental data than others. Some flameproofing salts and mixtures have been shown to function primarily by physical mechanisms. These materials are generally highly hydrated salts of fairly low melting point or mixtures of a hydrated compound and a low-melting salt. The mechanism appears to be the melting of the compound or mixture followed by the formation of a stable, solid foam formed by the evolution of decomposition products. The foam serves as a barrier between the fabric and the flame, affording thermal insulation and also entrapping combustible, tarry degradation products and causing them to be further degraded to the gaseous and solid phases. In some cases it has been proposed that a thick coating is formed around each fiber or thread, thus serving the same function. In the latter case of a continuous solid film it is probable that add-ons would necessarily have to be quite high.

Two credible theories have been advanced to explain the phenomenon of flame resistance on the basis of a chemical relationship with the fiber. In the case of inorganic acids and their acid salts the mechanism has been regarded as primarily chemical in nature. The data available, as mentioned previously, indicates the promotion of the decomposition of cellulose in the direction of solid char and water. One interpretation of this has been the existence of a catalytic dehydration reaction. This is supported by the efficiency of this class of materials at relatively low add-ons and the slight additional effect of much greater amounts of added retardant. Such an interpretation is also in line with the observed pyrolysis and combustion data. The acid anhydride formed at combustion temperatures is visualized as promoting the formation of water through its strong dehydrating action. It is further theorized that the attracted water is subsequently released regenerating the anhydride for continuous functioning. Such a mechanism is in agreement with the strong dehydrating action of the anhydrides, using phosphoric anhydride as an example, and is supported further by the fact that no flameproofing properties are displayed in cases where the salt is incapable of liberating the acid residue on heating.

The same phenomena can be interpreted in different terms on the basis of hydrogen bonding energies. The majority of flameproofing agents of this type are materials possessing high hydrogen bonding activity. Knowing that the secondary effect is a retention of decomposition products in the solid state, the formation at flame temperatures of a residue capable of attracting and holding adjacent cellulose chains appears to agree well with observed facts. Normally, water molecules may be pictured as serving in the capacity of cross linkages between adjacent cellulose chains. At flame temperatures, the water molecules are volatilized permitting cellulose to be thermally degraded into relatively small fractions which contribute to the combustible tarry vapors. The partial replacement of water in this case by materials having strong hydrogen bonding properties, which at the same time are not volatile at flame temperatures promotes continued interlinkages even at extremely high temperatures. The resulting increase in the average size of fragments formed would be expected to result in the observed increase in solid residue at the expense of volatile tarry vapors.

Some flameproofing materials can not as yet be assigned to either of the two preceding categories. When more is known of their performance at elevated temperatures in the presence of cellulose, they may show more apparent similarities. For the present, many carbonates and ammonium salts, as examples, are believed to function by the evolution of large quantities of non-combustible vapors. The evolution of appreciable amounts of incombustible gases or sublimate is claimed to dilute the combustible atmosphere surrounding the fibres. Though entirely possible that such a mechanism does contribute to the overall effect, there is no appreciable evidence to indicate that this should be considered as one of the primary causes of flameproofing action. It should be borne in mind, however, that any one retardant may well function by more than one of the mechanisms suggested. In fact, this is probably the case in most instances.

A final theory which has been advanced is that some compounds reduce flaming tendencies by the absorption of large quantities of heat through endothermic changes of state. This has not been substantiated experimentally. As a matter of fact, one of the more effective water soluble mixtures undergoes an exothermic change on heating.

It has only recently been recognized that the phenomenon of afterglow is an independent and entirely different reaction from that of afterflame. Many compounds or mixtures effective in flame-retardation actually enhance the flameless combustion of the char. There are very few effective glowproofing agents and correspondingly few theories as to their method of operation.

Since atmospheric oxygen is one of the reactants in the oxidation of carbon, any reduction in the availability of oxygen should reduce the glowing tendency. It has been reported that certain salts produce a continuous film on the fibers when heated to flame temperatures. Such glossy coatings might well reduce the tendency of the carbon filaments to oxidize vigorously. Support for the theory is furnished by the effectiveness of certain resinous finishes in reducing afterglow. Add-on requirements, as might be expected, are quite high.

A more efficient and better substantiated mechanism is based on a purely chemical effect. The addition of 0.5 per cent to 1 per cent of a thermally unstable phosphate to a fabric prevents any afterglow. Additional amounts do not contribute to glow-prevention, though flaming is progressively reduced. The effectiveness of such small quantities would appear to be catalytic in nature. Fairly detailed laboratory studies have revealed more of the nature of this catalytic reaction. By carrying out the pyrolysis of a fabric in an inert atmosphere, the thermal degradation can be completed leaving a substantial char. By thus separating the flaming and glowing reactions, it is possible to study separately the afterglow or oxidation of the charred residue. If the char from an untreated fabric is oxidized, the ratio of CO_2 to CO in the resulting gases is approximately 4.6. The addition of 4 per cent diammonium phosphate to the original fabric reduces the CO_2/CO ratio to about 0.5. This effect on the gaseous oxidation products is not shown by materials which do not possess glowproofing properties. The evidence thus indicates a catalytic effect on the course of the oxidation of carbon. In the preferential formation of CO rather than CO_2 a reaction of lesser exothermicity results, since the heat of reaction is reduced from 94.4 kilocalories per mole to 26.4 kilocalories per mole. Apparently, when the principal oxidation product is CO the heat produced is insufficient to support a self-sustaining glowing reaction.

In the above discussions, consideration has been restricted to cellulose and fabrics of cotton, or regenerated cellulose. Since the flameproofing mechanisms are, for the most part, chemical reactions, modification of the chemical nature of one component may have a profound effect upon the rate and course of the reaction. For this reason, nitrate, acetate, protein fibers and nylon must be considered as separate problems. Due probably to the combination of chemical and physical effects, some of the flameproofing compounds which are effective with cotton are also effective with other fibers. This is certainly not necessarily so, however, and exceptions have been noted.

Flameproofing Treatments

Many different systems of classification could be employed in the grouping of flameproofing treatments according to type. The criteria which might be used as a basis for separation are: the chemical nature of the active ingredients, the mechanism by which they are thought to function, the durability or permanence of the treatment in terms of resistance to leaching, laundering and drycleaning and, finally, the method of attachment to the fiber. I shall make more or less use of all four of these subdivisions in the course of the following discussion.

Until 1940 to 1941, the majority of the flame-resistant treatments available in this country were of the water-soluble or transient type. Over a period of many years, nearly all the common water-soluble inorganic salts have been recommended for influencing the burning characteristics of wood, paper and textile fabrics. The hundreds of compounds and mixtures suggested, however, can be reduced to less than two dozen highly effective formulations. These may be subdivided according to the mechanism by which they are thought to function, bearing in mind that any one retardant may owe its effectiveness to more than one mechanism.

The most effective agents in preventing after-flaming are those which function by the physical mechanism of erecting a solid foam to serve as a barrier between fabric and flame. The salts or mixtures of this group must melt at relatively low temperatures and subsequently resolidify in the form of a solid foam produced by the evolution of decomposition products. They are often highly hydrated salts or mixtures containing a hydrated constituent. Examples which might be cited are: mixtures of borax and boric acid, aluminum sulfate and boric acid, borax and ammonium phosphate and many others. Although there are relatively few efficient single compounds in this class, the number of mixtures which have been developed is enormous.

Probably the largest group of single compounds occurs with the inorganic acids, acid salts and compounds capable of liberating acids on heating. The members of this group, which are associated with the catalytic dehydration and hydrogen bonding theories mentioned earlier, are less effective than the preceding group in reducing afterflaming but considerably more effective in the reduction of afterglow. Representative examples are: the phosphoric acids and their ammonium and amido derivatives, sulfuric acid and the ammonium salt, ammonium molybdate, zinc chloride, antimony oxychloride, and many others. To be effective, the members of this group must be able to release the acid anhydride on heating, at least in the presence of cellulose. A simple example which demonstrates this clearly is the relative performance of orthophosphoric acid and its sodium salts. The acid itself is capable of rendering a fabric completely flameproof at add-ons of 10 to 11 per cent. The monosodium salt is fairly effective at add-ons of the order of 17 per cent. Disodium orthophosphate, on the other hand is a very poor retardant even with add-ons of 56 per cent and the trisodium salt shows no flame-resistant properties when present to the extent of 77 per cent.

Compounds which decompose or sublime on heating, evolving large quantities of non-flammable gases or vapors were credited with diluting the combustible atmosphere surrounding the fibers. This group would be represented by carbonates, some chlorides, some ammonium salts and highly hydrated compounds. The outstanding members are the ammonium halides, which thus far do not demonstrate any of the characteristics required by the two previous classes of compounds.

All of the temporary flameproofing treatments are destroyed by leaching or laundering. They are therefore applied with the intention of periodic reapplication in order to maintain effectiveness. Even more serious than their solubility, however, is their tendency to lose effectiveness upon exposure to high temperatures and humidities or, in some cases, even on prolonged exposure at ambient temperatures. This necessitates periodic testing and reprocessing and gives rise to a feeling of false security in some instances where control measures are not actively pursued. In some instances, the changes in composition brought about by vaporization

or decomposition do not reduce the flame retardancy of the treatment but do leave an acid or alkaline residue which adversely affects fabric strength. This latter effect is sometimes pronounced when the treated material is subject to ordinary ironing or mangling. The principal advantages of the temporary treatments are that they are easily applied and highly effective at relatively low add-ons. The 12 to 15 per cent added solids required are generally cheap and do not greatly affect the desirable physical characteristics of the fabric.

Permanent flameproofing treatments can be divided into two broad classifications; those in which the active retardant is added to the unmodified fiber and those which depend for flameproofness and durability on a chemical modification of the fiber itself.

Of the former group, the double-bath type of process was most popular in the early attempts at permanence. The treatment essentially consists of saturating the fabric with a soluble salt and then immersing in a second solution, the contents of which react with the impregnated salt to render it insoluble. In the simplest case, the double decomposition is produced with two aqueous solutions. Many variations are possible using an organic solvent in one case or even producing the desired reaction by subsequent treatment in a gaseous medium. A typical example is the Perkins process, where hydrated stannic oxide is precipitated by immersion in a solution of sodium stannate followed by an ammonium sulfate bath. Many modifications of this have been introduced, accomplishing the precipitation with sulfuric acid or the sulfates of copper, chromium, manganese or iron. A novel variation of this general technique is the dissolution of the two reactants in an organic solvent of suitable dielectric constant, employing water or an aqueous fixative solution as the second bath. In most cases, the two-bath flameproofing processes require higher add-ons, of the order of 20 to 30 per cent, and are only partially resistant to leaching and laundering. In their favor, however, is a tendency to produce an even and efficient distribution by virtue of good penetration. Accordingly, there is less effect upon the desirable physical characteristics of the fabric than in the case of the pigment dispersion treatments which follow.

In the past 10 to 12 years the double-bath type of process has, in most instances, given way to pigment dispersion techniques. The principal reasons have been the better permanence of the latter type, and the comparative ease of application. Instead of attempting to deposit flameproofing constituents in the fabric, the components are powdered and the finely divided material applied in the form of a suspension or emulsion. Such treatments have been applied partially dissolved and partially suspended in organic solvents, as water-in-oil emulsions and as emulsions having water as the external phase. Many types of organic and inorganic flameproofing compounds and mixtures can be applied in this manner. For example, the active component of a two-bath process may be prepared in advance and applied in the form of a suspension or emulsion. Probably the most common formulation in the past has been a combination of metallic oxide and suitable chlorinated material. The solvent suspension is generally the most effective medium of application but emulsion vehicles are preferred for reasons of economy and ease of commercial application. As is true of any currently available flameproofing treatments, the pigment dispersion formulations have some disadvantages. The add-ons required are generally 15 to 20 per cent higher than in the case of water soluble retardants, and 5 to 10 per cent higher than with the better two-bath processes. Depending upon the type of fabric, there is sometimes an undesirable influence upon physical characteristics such as hand or color. Skillful formulation of the emulsion vehicle and selection of proper chemical and physical finishing operations can eliminate or at least minimize this criticism in the majority of cases. Counter-balancing these drawbacks are several striking advantages. Probably the greatest of these is the simplicity of application. The emulsions are easily applied on common finishing equipment such as is generally encountered in any dye house or finishing mill. It is possible to run at high finishing speeds up to 140 yards per minute and drying can be accomplished at regular drying temperatures. The treated fabrics, when properly impregnated, possess the greatest degree of permanence of any of the durable flameproofing processes, being equally resistant to drycleaning and laundering with neutral or alkaline detergents. The application of the flameproof or flame-resistant finish leaves the fiber with its tensile strength unaffected, or in most cases, materially improved. Similarly, the loading of the fabric by virtue of the add-on required, can often be turned to advantage in the improvement of underweight or sleazy fabrics. Finally, by proper compounding, it is possible to include in the one operation, additional processes such as pigmenting, mildew-proofing and the application of crisp finishes or permanent sizes. Good compatability is also experienced with commercial softening and water-repellent finishes.

The most recently developed approach to durable flameproofing consists of chemically modifying the cellulose molecule such that it shall possess inherent resistance to flame and glow. The principal application thus far has been through esterification with inorganic acids, notably phosphoric. In order to obtain efficient flame resistance, it is only necessary to form the cellulose phosphate ester. The additional characteristic of resistance to detergency and exchange reactions, however, necessitates the formation of suitable amido salts of the acid ester. The permanence of the finish is proportional to the degree of esterification and the extent and complexity of the amine or amide combination. The advantages inherent in the cellulose-ester type of treatment are based on the penetration obtained in the course of impregnation and the nature of the flame-resistant complex itself. Efficient flame and glow resistance can be obtained at lower add-on than in the case of the pigment dispersion processes. Also, the finish has less effect upon the physical characteristics of the fabric such as hand and color. The method in general has the following disadvantages. The duration and critical nature of the curing operation requires either specially developed and carefully controlled drying apparatus or an extremely slow running speed on routine drying equipment. The esterification process is accompanied by a loss in fabric strength, the severity of which is dependent upon the curing conditions selected. The treated fabric is generally less resistant to leaching and laundering than with the pigment dispersion type, due to the susceptibility of the cellulose phosphamate to ionic exchange phenomena. Attempts to achieve comparable permanence generally result in corresponding increases either in add-on or in the tensile strength loss occurring during the curing reaction.

This discussion of flameproofing processes has been based primarily upon experience with fabrics of natural or regenerated cellulose fibers. As was pointed out in discussing the mechanisms by which these materials function, the same flameproofing compositions may be applicable to other fibers such as acetate, wool, silk, etc. This is not necessarily so, however, since the change in one of the reactants may alter both the path and the rate of the reactions involved.

Members should notify the Secretary immediately of all address changes

Testing for Fire Resistance*

JAMES R. REDMOND

Chairman, Committee on Testing Fire Resistant Materials

THERE was an interesting discovery made in one of our nation's largest cities several weeks ago. It seems that after the Winecoff Hotel disaster the principal newspaper in this particular city, conducted a survey of the safety features of the hotels and then published a detailed report. The discovery of which I speak, was revealed in the opening sentences of the report and I would like to repeat them for you:

"Maybe you didn't sleep well in your hotel room last night because you were afraid of fire. You couldn't forget that you can't climb to safety from a tenth story window because fire ladders here reach only eight stories. Even if you were on the eighth floor a trip down the ladder would be bad."

I am told by the author of that article that the hotels were deluged with requests from their guests who wanted the room nearest the stairway and no higher than the second floor.

There are many tests for fire resistance. If you want some excellent references to these tests I suggest you obtain a copy of the latest Bureau of Standards publication on the Flameproofing of Textiles—I believe it is Letter Circular LC 818—or you might obtain a copy of a paper entitled "The Fireproofing of Textiles" prepared by the Textile Research Institute.

The numerous test methods use sample specimens varying from a few inches to seven feet in length. Methods of ignition include matches, candles, gas flames, burning coals, electrical units, alcohol, kerosene and others.

Position of the sample at the time of test is either vertical, horizontal or at a 45° angle. Time of exposure to flame varies from a few seconds to five minutes. Interpretation of test results is based on such things as:—how long the sample continues to flame after the source of ignition is removed, how long it continues to glow after the flame has gone out, how far the glowing travels over the original dimensions of the sample, loss in weight of the sample and rate of burning. Our own AATCC test uses after-flame time and char length as criteria.

* Presented at meeting, Rhode Island Section, February 28, 1947.

What should we consider to be a good test method for fire resistant textiles? I think we may list the following factors as a sound basis for a test method:

Basis for Test Method

1. The test must provide a means of determining whether a fabric will support combustion under certain conditions.
2. The test must provide a means of comparing the fire resistance efficiencies of various fabrics and finishes.
3. The test must be a reasonably severe one and hence a safer test in the long run.
4. The test must be sufficiently standardized to yield results which may be duplicated in all laboratories.
5. If possible the test should involve apparatus which is both simple and economical to construct and operate.
6. The test might be more valuable if it duplicates under measurable conditions the test most likely to be used by mills, converters, wholesalers, retailers and customers while the goods are in motion toward the market. I will elaborate on this sixth factor in just a moment.

AATCC Test

Our AATCC test is closer to meeting these requirements than any other test with which I am familiar.

We expose a vertically suspended 2½ x 10 inch specimen to a 1½ inch Bunsen Burner luminous flame for 12 seconds. The QM Corps uses the same test. The Bureau of Standards, National Fire Protection Association, State of California and other organizations run the same flame exposure but use a 2 inch x 12½ inch specimen.

Our AATCC apparatus requires a Bunsen Burner with a pilot light attached. The position of the Burner is fixed at all times and flame exposure is controlled by a valve which is simply opened for 12 seconds and then closed. The other organizations ignite the Burner and slide it under the sample to start the test and pull it away after 12 seconds. We believe our control of the flame exposure is better here and we hope to see these other organizations adopt the pilot light system.

Based on our extensive laboratory investigations of this test during 1945 and 1946 it is the general opinion of our committee that if the AATCC test is run as described in the year book, with the single exception that the sample be allowed to char in the test cabinet instead of in a separate hood, an efficient and uniformly processed fire resistant fabric will pass the test and there will not be any significant differences between different laboratories.

If however, the fire resistant fabric is of border-line efficiency or if the finish has not been applied uniformly to the fabric then we may expect significant differences in test results.

Differences in Test Results

At this time we have data which suggest that variation in Relative Humidity may throw a border-line fabric on either side of the line. The higher the humidity the more likely it is that a border-line fabric will pass the test. This phase of the problem is now being studied. We have prepared some border-line fabrics and you will see the results of this work in published reports when our data are complete.

The variation of BTU values of different fuels has frequently been considered an important factor. Our data do not support this belief. We are of the opinion that with the small luminous flame we use, the variations in BTU values per cubic foot of gas, will not materially affect the energy output of the flame.

It is suggested that for the Burners used, the height of the luminous flame will determine fairly well the energy output. We have found that differences in hoods are important factors in char or glow tests. Also we know that fire resistant fabrics tend to glow more when they are ignited in folds or layers. I recall an experiment on a fire resistant tent. A blow torch was used for ignition and the resulting flaming and charring were negligible except at the eaves where charring would not stop.

(Continued on Page P148)

Flammability of Wearing Apparel*

DR. HERMAN E. HAGER

Chairman, Committee on Flammability of Consumer Textiles

IT is a privilege to address our own Association for the first time on this subject which probably has caused more publicity and more controversy than any other AATCC committee work.

It was nearly two years ago here in Providence that our committee was born. Your Section then was host to the Council and Dr. Olney announced that he had been approached by the National Retail Dry Goods Association to have the AATCC set up standards for measuring fabrics' flammability. The reason for this had been a number of fatal accidents and particularly the passage of a bill in California in January, 1945, which banned all fabrics more flammable than cotton in its natural state. It did not matter that this first bill was not enforceable. The excitement was nevertheless tremendous and our committee of seven members was off to a high pressure start.

First we studied fabrics—all of course burn, but with very varying degrees. Wool and silks and nylons are quite safe, most cellulose dress fabrics burn slowly, many napped, brushed, and tufted cottons or rayons flash rapidly over the surface, sheer or net fabrics burn fast, and pyroxylin coated textiles ignite slowly but burn with a vicious, voluminous flame. Flammability essentially is rapid combustion and in wearing apparel a dangerously flammable material, if ignited, burns so rapidly that the wearer has no time to extinguish it or tear it off before serious or even fatal burns have occurred.

It was our aim to segregate the dangerous from the harmless fabrics and to do this with the help of a machine which would evaluate the rate of burning. Following our specifications the U. S. Testing Company built such a machine for us which was changed many times before it finally developed into an all automatic tester operating with a standardized Butane flame on which human error is eliminated. A method was then worked out which also had to undergo a lot of changes. For instance, we found it necessary to test out samples in a dry state, that is, in their most dangerous condition. We had to construct a combing machine to equalize the surface of shaggy fabrics; we adopted a simple washing and dry cleaning procedure to remove water and solvent soluble flame retardant finishes which would lull the user into a false sense of security.

The method establishes the rate of burning by measuring the speed with which a flame will travel over the surface of a fabric suspended on a specimen rack at a 45° angle. Any five inch sample which burns faster than six seconds is to be considered dangerous. This dividing line was arrived at with special consideration of scores of fabrics which had actually caused fatal accidents. When we finally got good results, we constructed six more machines and then had the satisfaction that correlation on the same fabrics could be obtained in seven different laboratories in different locations.

Then we submitted the machine and method to our Research Committee just one very busy year after starting, and we suggested its use for the testing of flammability of wearing apparel.

The National Bureau of Standards decided to accept this machine and method as a commercial standard for which it had to be approved by hundreds of textile interests which brought scores of comments and necessitated dozens of minor revisions. It is now in its final draft.

Incidentally, A.S.T.M. also intends to adopt our machine and method.

With all this, our committee work should really have ended. Actually, however, it was only the beginning, at least for some of our members.

Dr. Ingberg of the National Bureau of Standards presented a horizontal tester as a good instrument to evaluate fabrics' flammability. However, at a demonstration of the machine at one of our meetings in New York an 80 square cotton sheeting, which in our machine is barely scorched, burned rapidly and a shaggy brushed rayon would not even flash over the surface and burned very slowly. However, Dr. Ingberg did not withdraw the machine.

In April 1945, five boys playing around an open brush fire in Washington were burned to death and five others were seriously injured when the shaggy rayon chaps of their cowboy suits caught fire. Our legislators wanted a law passed and Congressman Johnson introduced a bill which was based on Dr. Ingberg's machine. By request a delegation took our tester to Washington and at the Bureau of Standards ran a comparative series of tests which again proved our machine thoroughly accurate and satisfactory. Last December, another Congressman, the Honorable Canfield of New Jersey introduced a bill based again on the horizontal tester.

Meanwhile, in California, the first bill which was not enforceable had been amended. It now left the decision as to what are flammable fabrics to the discretion of the Fire Marshal. Mr. Yockers, the Fire Marshal, knew of our committee; he also visited us last June. He had constructed a tester much like our model, yet with various differentiations and for November 6, he called a Fire Advisory Board Meeting in Los Angeles to have his rules and regulations approved. These included draperies and if enforced in that form would have brought confusion and spelled untold hardships on retailers and converters. Therefore, to give any possible technical advice and to defend our AATCC method, three of our committee members, Mr. Dorn, Dr. Bonnet and I went to Los Angeles and after demonstration and many discussions, Mr. Yockers and his group decided to drop draperies and stick to wearing apparel only. The California legislature reconvened on January 6, which was tantamount to immediate enforcement of the Act. Of course, converters, who did business with California and all retailers in that state were much upset, as on such short notice nobody was prepared to meet the situation. A bill, sponsored by the retailers, was therefore introduced which sought postponement of enforcement until April 1948, but it was thought it would be vetoed, if passed. A compromise was then arrived at which left the act with Mr. Yockers for further study and revision.

(Concluded on Page P149)

* Presented at meeting, Rhode Island Section, February 28, 1947.

Intersectional Contest—

An Evaluation of the Kupensaure Process*

Presented by the
PIEDMONT SECTION

SINCE the year 1925 the production of rayon has increased over eight times. The increase is shown below:

CONSUMPTION OF FIBERS**

Year	*Cotton* %	*Wool* %	*Rayon* %	*Silk* %	*Total* %
1925	86.6	9.9	1.6	1.9	100
1935	79.9	11.9	7.4	1.8	100
1945	76.1	10.9	13.0	..	100

During the same years as above the production of vat colors has increased 14.4 times. This increase is shown in the following table:

SALE OF VAT COLORS†

Year	*Sale of Vats*	*Sale of all Colors*
1925	2,253,000 lbs. (2.8%)	79,303,000 lbs.
1935	12,129,000 lbs. (12.4%)	97,954,400 lbs.
1945	32,423,000 lbs. (23.6%)	137,171,000 lbs.

Since the use of vat colors has increased, and since the use of vat colors on rayon has increased, the Piedmont Research Committee believes that any aid that can be given to the textile colorists in regard to vat color application is now timely and will continue to be of interest and importance to the textile industry.

Purpose

The purpose of this paper is to evaluate the Kupensaure process and endeavor to develop it as a tool whereby textile colorists may, through simple tests, determine if they can use this process to advantage in the application of vat colors to synthetic and natural fibers.

General Discussion

The Kupensaure process is a new development of vat color application. Normally, vat colors are applied on the alkaline side. Many experimenters and colorists have known that pre-treatment with an organic acid or neutralizing with an organic acid, or even applying vat colors in the acid range, have shown improvement over conventional methods. Mention of such procedures has appeared at various times through the known literature on vat color application. In March, 1941, the *Textile Colorist* published an article written by F. G. Brown that announced several new methods of vat color application, emanating from the I. G. Laboratories at Leverkusen. The reason for these new processes was the desire to dye staple or spun rayon with vat colors. The particular trouble with spun rayon arises from the property of the regenerated cellulose of absorbing dyes much more rapidly than does cotton; and to the undesirable ease and extent to which this type of cellulose swells upon wetting. This swelling tends to close up the space needed for penetration and to make hard packages. When such trouble is recognized, it can be overcome in some cases by such mechanical remedies as loose packing and loose winding.

Rayon piece goods also have a tendency to swell when wet and even penetration is difficult in the woven piece. In this paper, we would like to consider the Kupensaure process as compared with the conventional stock vat method and then we would like to show, through our exploratory work, how this process has been tested and used through modification and can be of value in applying vat colors, not only to rayon but also to cotton, and other fibers.

Our paper is in no way to be construed as an outright recommendation for the use of the Kupensaure process to replace the conventional stock vat method, but we will attempt to show that this process does have merit and through the results that we have obtained experimentally, can lead the textile colorist into the better application of certain vat colors in certain instances where the conventional methods of application have failed.

In 1946, the speaker, Norris Rabold, visited Germany in an endeavor to uncover information related to textile dyeing and finishing. Dr. Miles A. Dahlen, member of a previous team investigating textile dyestuffs and chemicals, obtained information relative to the Kupensaure (vat acid) method from the I. G. Farben. Included in this was Dr. Joachim Muller's report No. 7 on this process. Dr. Dahlen passed this information along to the speaker and other members of the Textile Processing Team with the thought that it be investigated more thoroughly. It has been known that the "vat acids," that means the free leuco compounds obtained during the neutralization of vats by the substitution of hydrogen for sodium, (herein called "vat acids") may be isolated in a form relatively stable to oxidation. Furthermore, it has been proven that the vat acids in contrast to the sodium leuco compounds or generally speaking, alkali leuco compounds, have little or only small affinity for the vegetable fiber and regenerated celluloses.

For a better understanding of the Kupensaure process, let us for a minute consider the characteristic features of the conventional stock vat process since it precedes the more recent researches about the vat acid. In the stock vat process, a very highly concentrated stock vat is added to the diluting liquor (dye bath) containing the dyeing assistants. Hereby, and this is the decisive

COMMITTEE

Peter S. Gilchrist, Jr., *Chairman*
James N. Grant
Kenneth McKenzie
Dyer S. Moss
John V. Kilheffer
Thomas J. Nuckolls
George Jones
J. R. Ellis
S. H. Williams
L. L. Trexler
Thomas R. Smith
Clarence Hooper
Charles B. Ordway
Lawrence L. Wyss
R. Norris Rabold
Edward Briggs
James Grier
Speaker
R. Norris Rabold
Judge
Hobart Souther

* Presented in Intersectional Contest, Silver Jubilee Convention, Hotel Statler, Boston, Mass., December 13, 1946.

** *Rayon Organon, February,* 1946.

† *Dyes and other synthetic organic chemicals, U. S. Tariff Commission,* 1945.

feature of the vat stock process—a more or less extensive hydrolysis of the sodium leuco compound takes place with the formation of the free vat acid. Thus, one obtains by dilution, a state in which the affinity of the dyestuff is nullified for the greatest part. The material is then impregnated with the solution and by gradual addition of caustic soda solution and hydrosulfite, the dyestuff is again given its affinity. In this way, the dye bath is rereduced and the material is more uniformly penetrated.

The above conventional process is limited by the following facts:

1. Not all sodium leuco compounds of vat dyestuffs are sufficiently hydrolized by dilution.
2. Only small quantities of caustic are used so that in some cases a rearrangement of the normal leuco compound with formation of the stable leuco forms (keto-forms) which have no tinctorial power has to be feared.

The above statements apply especially to dyestuffs of the Indanthrene blue group in strong concentrations. In one practical case, the full dyeing of the Indanthrene Blue RSN and GCDN on warm beams, a new method was followed in that after diluting the stock, the liquor was entirely neutralized. Even the first experiments showed that the vat acid may be obtained with certainty in the form of colloidal solution by applying suitable conditions which deviate from those of the stock vat process.

With the above as a starting point, all further research work has to explore the opportunities offered by the extremely finely distributed leuco compounds.

Let us take a minute from the text to look at two graphs which represent the cycle of pH as noted in a conventional stock vat application and the cycle as represented in the Kupensaure (vat-acid) method. (See graphs below.)

Now let us consider the actual procedure in preparing the Kupensaure vat. Practically the stock vat is first prepared and if weaker concentrations are to be used, it is diluted, prior to acidifying, near to the final concentration. Thereupon, it is neutralized by means of the necessary quantity of acetic or formic acid, calculated upon the quantity of caustic soda solution used. Too much acid is not detrimental but the neutralization should never be carried out incompletely. We have found through actual experimentation that a pH of 5.5 is desirable.

As an approximation for the necessary quantity of acid, it should be mentioned that one liter of caustic soda solution of 40° Bé. corresponds to 1.34 liters of 56% acetic acid, or 0.6 liters of 80% formic acid. It is best to make sure of the ratio of caustic soda concentration to acid by actual titration.

The neutralization is best carried out by adding at once, all of the partially diluted acid while agitating well. The sooner the neutralization takes place, the surer is the result, as it is known that the transition to the vat acid state, in most cases, can be recognized by an intense change in color. For instance, with Vat Blue RS by the change from blue to violet, with vat brilliant green type from blue to bluish red. Finally, with indigoid dyestuffs, the orange and yellow vats become colorless.

In order to facilitate the testing of the various dyestuffs by the vat acid process, it was thought more practical to make two formulas which would be more or less valid for all dyestuffs. In the following formulas I and II, formula I comprises the concentration range from 1-6 grams and formula II to 7-20 grams of powder.

KUPENSAURE
VAT ACID PROCEDURE

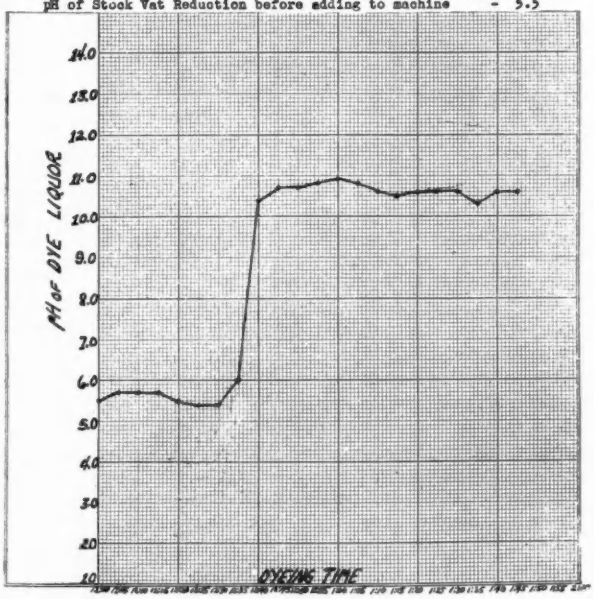
DETERMINATIONS OF VARIOUS pH WHEN USING THIS METHOD

COLOR: VAT GREEN
COUNT: 38/2 Combed Peeler Cotton Yarn

pH of Boilout Solution after 15 minutes circulation- 9.1
" " " " " 20 " " - 9.1
" " " " " 25 " " - 9.1
" " " " " 30 " " - 9.1

pH of Preparation Bath at 11:45 o'clock- 9.7
" " " " " 11:50 " - 9.5
" " " " " 11:55 " - 9.5
" " " " " 12:00 " - 9.1

pH of Stock Vat Reduction before adding Acetic Acid 56%- 10.5
pH of Stock Vat Reduction before adding to machine - 5.5



REDUCTION METHOD

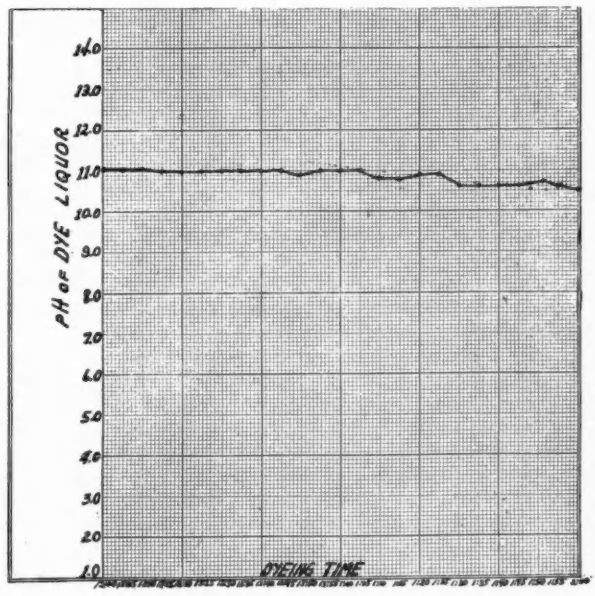
DETERMINATION OF VARIOUS pH WHEN USING THIS METHOD

COLOR: VAT GREEN
COUNT: 38/2 Combed Peeler Cotton Yarn

pH of Boilout Solution after 15 minutes circulation- 8.6
" " " " " 20 " " - 8.6
" " " " " 25 " " - 8.6
" " " " " 30 " " - 8.6

pH of Preparation Bath at 11:45 o'clock- 11.5
" " " " " 11:50 " - 11.2
" " " " " 11:55 " - 11.4
" " " " " 12:00 " - 11.2

pH of Stock Vat Reduction before adding to machine- 10.5



Formula I

1. Stock Vat:
   1-6 grams of vat powder fine
   5-10 cc. caustic soda solution 40° Be.
   3 grams of hydrosulfite
   2-5 grams of Setamol WS (dispersing agent)

   300 cc. 50-60°C. 3-5 minutes
2. Dilution:
   1 gram Setamol WS, with the dyestuffs of vat blue group
   1 cc. of Peregal OK, with vat blue BC
   1-2 grams Igepon T in
   650 cc. of water at 70-80°C.

   950 cc.
   6-12 cc. acetic acid 56% diluted to 50 cc.

   1000 cc.

At the end, addition of 1-2 grams Nekal BX and filtration through fine fabric.

Formula II

7-20 grams of vat powder fine
30 cc. caustic soda solution 40° Be.
10-15 grams of hydrosulfite
7-20 grams Setamol WS

900 cc. 50-60°C. for 3-5 minutes
36 cc. of acetic acid 56% diluted to 100 cc.

1000 cc.

At the end, addition of 1-2 grams Nekal BX and filtration through fine fabric.

The vat acid solution may be heated without difficulty to 70-80°C. In view of the greater penetration power, however, lower temperatures will suffice in many cases. When using the usual paste or powder brands, the quantity of Setamol in the stock vat is preferably increased by about 50%. Furthermore, with the powder brands the vatting must be prolonged 10-15 minutes. Below is shown the results of types that have been tested.

According to Formulas I and II, i.e. with 6 and 20 grams of powder, fine, per liter, respectively, the subsequent colors have been tested. The results are shown in table I.

In padding with the Kupensaure it is the same as the pigment process; in view of the better penetrating power of the vat acid padding solution it is possible however to reduce the number of passages in the subsequent jigging. It is expressly pointed out that the filtration of the vat acid solutions is absolutely necessary despite the fact that these solutions are colloidal. This is to insure the removal of any foreign bodies. Finally, it is important that the goods to be padded must be rinsed thoroughly to be free of any alkali. If this is not done, the vat acid solution gradually becomes alkaline in the color box, part of

TABLE I

Dyestuff	*Formula I 6g. powder fine per liter*	*Formula II 20 g. powder fine per liter*	*Color of the vat*	*Color of the vat acid*	*Colour Index*
Yellow G	not suitable by itself, in certain mixtures, however, good	not suitable by itself, in certain mixtures, however, good	Blue	Blue Green	118
Yellow GF powder fine	at the limit	at the limit	Olive	Yellow Orange	1118
Golden RK Yellow powder fine	good, clear	good	Bordeaux Red	Orange Red	Pr. 292
Golden-Yellow GK powder fine	good	good	Bordeaux	Orange	Pr. 291
Yellow 3R powder fine	good	good	Brown Red	Greenish Brown	
Golden-Orange 3G powder fine	good, clear	good, clear	Yellow Brown	Yellow Brown somewhat greener than color of the vat	Pr. 290
Golden-Orange G powder fine	good, clear	good	Crimson Red	Orange	1096
Orange RRT powder fine	good	good	Red-Violet	Orange	1097
Brilliant Pink R	good	only up to 10 g.	Yellow	Milky	Pr. 109
Brilliant Pink B powder	good	only up to 5 g. powder	Yellow	Milky suspension	108
Brilliant Pink 3B powder fine	good	good	Yellow	Formula I clear, light Reddish Formula II Milky suspension	Pr. 288
Rubine R powder fine	good	unsuitable	Green Blue	Blue Violet	Pr. 124
Red-Violet RRN powder fine	good	good	Yellow	Milky suspension	
Red-Violet RH paste	good	good	Olive-Green s'owly Fuchsine Red	Milky suspension	1212
Brilliant Violet	good	good up to 10 g. powder fine	Red Brown	Violet Brown	1104
Brilliant Orange GK powder fine	good	good	Red Violet	Dull Orange	Pr. 287
Brilliant Orange	only suitable at 1-2 g. per liter and 10 g. Setamol WS per liter	unsuitable	Olive-Green with Red fluorescence	Red-Brown	116
Brilliant Orange RK powder fine	good	good	Red-Violet	Orange	116
Orange 4R paste	good	good	Red-Violet	Red-Brown	1098
Scarlet R paste	good	good	Red Violet	Gray Brown	
Red RK powder fine	good	good	Claret Red	Yellow to Brown Orange	1162
Red FBB powder fine	good	good	Dull Brown	Yellow Brown	Pr. 296
Violet FFBN powder fine	good	still good	Gray Blue	Red Brown	1163
Brilliant Violet 4R powder fine	good	good	Clear Blue	Red Violet	Pr. 117

TABLE I—(Continued)

Dyestuff	*Formula I 6g. powder fine per liter*	*Formula II 20 g. powder fine per liter*	*Color of the vat*	*Color of the vat acid*	*Colour Index*
Brilliant Violet RR powder fine	good	good	Clear Blue	Red Violet	1161
Brilliant Violet 3B powder fine	good	good	Clear Blue	Brown	Pr. 288
Dark Blue BOA powder fine	good	good	Dark Violet	Red Brown	
Blue RS powder fine	good	good	Blue	Violet	1106
Brilliant Blue R powder fine	good	good	Blue	Violet	1106
Brilliant Blue RCL powder fine	good	good	Blue	Blue Violet	1114
Blue CCD	good	with 20 g. at the limit	Blue	Blue Violet	1113
Blue BC powder fine	good	unsuitable	Blue	Reddish-Blue	1114
Blue 5G powder fine	unsuitable	unsuitable	——	——	1111
Green EB powder fine	unsuitable	unsuitable	——	——	
Blue Green FFB powder fine	good	good	Blue Violet	Bordeaux	
Brilliant Green B powder fine highly conc.	good	good	Clear Blue	Bluish Red	1101
Brilliant Green GG powder fine highly conc.	good	good	Clear Blue	Bluish Red	1101
Brilliant Green 4G powder fine	good	good	Blue	Red	1101
Olive Green B powder fine	good	good	Black Blue	Gray Brown	Pr. 293
Khaki GG powder fine	good	good	Red	Khaki	Pr. 122
Yellow-Brown 3G powder fine	good	good	Red Brown	Yellow Brown	Pr. 125
Brown R powder fine	good	good	Red Brown	Red Brown	1151
Brown FFR powder fine	good	good	Red Brown	Red Brown	
Red-Brown RR powder fine	good	good	Yellow Brown	Dull, somewhat yellow	PR. 121
Red Brown 5 RF powder fine	good	good	Red Brown	Somewhat Yellowish Red-Brown	
Red-Brown R powder fine	good	good	Reddish Brown	Red-Brown	
Brown G powder fine	good	good	Red-Brown	Yellow-Brown	1152
Brown 3GT powder fine	good	good	Yellow-Brown	Yellow-Brown	
Red-Brown GR powder fine	good	good	Claret Red	Yellow-Brown	1149
Olive R powder fine	good	good	Red Brown	Somewhat covered Yellow Brown	1150
Olive T powder fine	good	good	Gray	Olive Brown	
Gray RRH powder fine	good	good	Blue Gray	Dull Violet	1145
Gray 3B	good	good up to 10 g. suitable	Reddish Violet	Violet Brown	
Gray BG powder fine	good	good	Bordeaux	Brown	1123
Gray M powder fine	good	good	Blue Green	Reddish Dried Currant	
Gray MG powder fine	good	good	Blue Green	Reddish Dried Currant	
Direct Black RB powder	good	good	Dark Blue	Red Brown	Pr. 289
Black BB Powder	good	good	Dark Violet	Red Brown	1102
Black BGA Powder	good	good	Bluish Violet	Red Brown	Pr. 294

	Formula I	*Formula II*
Mixture with I' Blue RS powder fine for dyeing	Unsuitable	Unsuitable
Mixture with I' Blue CCD powder fine for dyeing	Unsuitable	Unsuitable
Mixture with I' Olive Green B powder fine for dyeing	good	good
Mixture with I' Olive T powder fine for dyeing	good	good
Mixture with I' Gray M powder fine for dyeing	good	good
Mixture with I' Red-Brown GR powder fine, for dyeing	good	Unsuitable

the vat acid is transformed into the sodium leuco compound and thus quickly oxidized. The dyestuff then precipitates in the form of flakes contrary to its behavior during oxidation—which besides takes place more slowly—in a neutral or slightly acid medium in which the fine distribution is not affected.

Development

The working conditions for the developing process are, likewise, the same as for the pigment padding process. On introducing the fabric, padded with the vat acid, into the blank solution one notices the characteristic difference from the pigment padding process, the considerable quicker formation of the normal vat color on the goods. It is easily possible to note the difference of the pigment pad over the vat acid method by dipping a piece of fabric padded with pigment and one padded with vat acid into the blank vat. Considerable difference can then be observed in the speed of development. On account of the high speed of the development of the vat acid the number of ends can be reduced against those padded with the pigment. Actual practice has shown a saving of up to 50% in the number of required jigg ends.

From the above discussion we may summarize for padding by the vat acid method the following suppositions:

1. It is possible to obtain the vat acids, i.e., the free leuco compounds obtained in the neutralization of vats, by replacing sodium with hydrogen, in an extremely fine subdivision, in many cases even as colloidal solutions. A good dispersing agent is Setimol WS. An addition of Peregal OK is recommended also, especially with blues (with the exception of Vat Blue BC which requires Igepon T).

2. In contrast to the sodium leuco compounds, the vat acids are practically without affinity.

3. The transformation into the sodium leuco compound takes place almost instantaneously.

Experimental

The research committee, after a thorough discussion, attempted to correlate a laboratory test with an actual plant trial. In order to eliminate confusion and to make this test as practical as possible, a known test was used with some modifications. This test was basically the Franklin Filter test. It will be noted that Tamol NNO (Rohm & Haas) was used as a dispersing agent. This material has shown good possibilities as a dispersing agent and had been checked previously by several of the laboratories.

Below is a Procedure of the Filter Test.

MODIFIED FRANKLIN PROCESS FILTER TEST VAT GOLDEN ORANGE GD PASTE

Step #1 3.5 grams of color weighed on watch glass
" #2 Wash into a 100-cc. beaker with not over 40 cc. water at 120°F.
" #3 Add 23 cc. caustic 10% solution
" #4 Bring volume to 70 cc. Heat to 140°F.
" #5 Add 1 cc. of a 10% solution of Tamol NNO
" #6 Add 2.5 grams of Hydrosulfite conc. Powder, sprinkling in with stirring
" #7 Reduce for 15 minutes at 140°F.
" #8 Dilute to 500 cc. with water and adjust temperature to 120°F. Add acetic acid to adjust pH 5.5. (Do not rinse reduced color from small beaker.)
" #9 Filter through 12.5-cm. Whatman's #4 filter
" #10 Allow solution to get fairly low in funnel and then
" #11 Wash with stream from a wash bottle containing 3.5 grams of sodium hydrosulfite in 500 cc. water at 120°F. (Use all of the 500 cc. water.)
" #12 Oxidize filter residue with a solution containing 1 gram of sodium perborate in 100 cc. water at 115°F. (Use all of the 100 cc. perborate solution.)
" #13 Record time of filtration and examine filter for residue.

Beside the laboratory filter test it was decided to run three colors by the conventional method as compared with the vat acid. For this purpose every laboratory participating was given an identical package of 20/1 carded yarn wound uniformly on Franklin Springs. The colors that were used on these package dyeings were Jade Green Dbl Pst. and Blue BCS Double and a vat Yellow (type purposely anonymous). The actual procedure for making these dyeings is listed below:

VAT ACID DYEING

Use the following procedure in dyeing yarn on one pound package machine. Dyeing Jade Green Double Paste first:

Dye volume of machine—approximately one gallon.
Weight of dyeing package—approximately 500 grams net
Boil package out with five grams of a good detergent at 180° F. for 15 minutes.
Drain boil out liquor and add approximately one gallon of water.
Raise temperature to 120° F. for Blue and 140° F. for Jade Green. Machine is now ready for color.

VAT ACID MIX

Make two of the following mixes:

To 125 cc of water at 140° F. for both Green and Blue, add five grams color (Jade Green Double Paste or Blue BCS type Double Paste).
Add five grams Tamol NNO to pigment solution and stir well to dissolve.
Stir in one gram caustic and one gram Hydro and allow to reduce 15 minutes.
After reduction, add 3.5 cc of 56% Acetic acid brought up to 10 cc with warm (140° F) water.
Allow to stand five minutes. Take one of these mixes and filter by Franklin Process, using No. 4 Whatman paper.
Take the other identical mix and add to package machine in four portions, starting outside in for five minutes, inside out for five minutes etc.
After addition of all color, run machine five minutes each way.
Now add to machine in eight portions the following: 10 gms caustic and 13 gms Hydro dissolved in 200 cc of water (10 cc inside out, 10 cc outside in—25 cc inside out, 25 cc outside in—25 cc inside out, 25 cc outside in—40 cc inside out, 40 cc outside in).
Run each of these portions for five minutes.
After addition of caustic and Hydro, run machine 20 minutes, five minutes each way.
Rinse with cold water for five minutes.
Oxidize with Perborate (1%) at 120° F. in new bath for ten minutes, five minutes each way.
Warm rinse and remove package.

NO SOAPING

Dry and check dyeing throughout package.
Hold results for inspection.

In the evaluation of the filter tests against actual dyeing all of the laboratories had trouble with filtering the Blue BCS type and had good success with the filtering of the Jade Green and Vat Yellow. However, some of the actual package dyeings on the Blue BCS came up quite well after the filter test showed poor filtration. The Jade Green and Vat Yellow both filtered well and also dyed well. Evidently the filter test is not a reliable criterion as to the application of the Kupensaure process in actual practice.

In the discussion, one member of the research group expressed the fact he was having difficulty with dyeing Jade Green on spun rayon. This statement gave the other members of the committee an actual

opportunity to dye this color by the vat acid method as outlined in our test dyeing procedure. The results were very gratifying because three independent laboratories reported much better dyeings by the vat acid process than by the conventional reduced vat dyeing. The vat acid dyeings were much more level and much better penetrated and showed no undyed portions or cross overs as was evident in the conventional method. This actual proof of the exploratory work on the vat acid process is best understood by seeing the actual packages. Actual exploratory tests show that different manufacturers' types of the same dyestuffs vary when applied by the Kupensaure process. This seems due to dispersing agents contained in the dyestuffs themselves.

During the period that this experimental work was underway, practical runs were also being made and we can give actual formulations used on thousands of pounds of cotton yarn. The formula is attached.

REPRESENTATIVE FORMULA
"KUPENSAURE"

(Vat Acid Procedure)
For Obermaier Package Machine

COLOR: Vat Green
COUNT: 38/2 Combed Peeler Cotton Yarn
YARN WEIGHT: 10 pounds dye and chemicals figures on weight of yarn
liquor ratio 1 to 10
After yarn has been wet out, add

1% Nekal NF
1% Igepon T Gel
} to machine, circulate 15 minutes at 100°F. before adding dye.

Make A Stock Vat Reduction Of:
7.00% vat Jade Green supra dbl. paste Colour Index 1101
1.90% vat Navy Blue BRP paste
5.50% vat Golden Orange 3GA paste prototype 290
3.00% caustic soda
2.50% sodium hydrosulfite
0.80% Nekal NF
1.00% castor oil

Vat 10 minutes at 140° F., then before adding dye to machine bring the stock vat to a pH of 5.5 by adding 500 cc's or the required amount of acetic acid 56%. When the pH of 5.5 has been obtained, the dye is added to the machine as follows:

Add 1/3 dye to machine at 12:00 OUTSIDE-IN
Add 1/3 dye to machine at 12:10 INSIDE-OUT
Add 1/3 dye to machine at 12:20 OUTSIDE-IN

Make a solution of caustic soda and sodium hydrosulfite using: 7.00% caustic soda and 6.50% sodium hydrosulfite.

Make solution of 3,000 cc's with water.

Start continuous flow of caustic soda and sodium hydrosulfite solution at 12:30 o'clock to flow gradually until 1:00 o'clock.

Run until 1:45 o'clock—check and drop.

FINISH

0.75% sodium hydrosulfite—wash—100° F.—10 minutes
running wash—10 minutes
cold wash—10 minutes
1.00% sodium perborate—120° F.—20 minutes
cold wash—10 minutes
1.00% sodium perborate—120° F.—20 minutes
cold wash—10 minutes
1.00% Olive soap
0.50% Igepon T Gel
} 180° F.— 30 min.
hot wash—140° F—15 minutes
cold wash—10 minutes

DYEING TEMPERATURES

Start at 100° F.	12:00 o'clock
Raise to 140° F. by	12:45 o'clock
Raise to 165° F. by	1:05 o'clock

Timer adjusted to 12:00 o'clock at beginning of all operations regardless of time of day.

Beside this actual formula we also have two other mills that have run the formulation shown below. One of these plants is dyeing the yarn on packages and the other on beams. To date over 100 beams have been dyed with this formula.

VAT ACID PROCEDURE

MAIZE — Gaston County Stainless Steel Machines—586# 16/1 cotton yarn—beam dyed—ratio 8:0
Boiled out at 180° F. 15 min. with 1% penetrant 0.077% vat Golden Yellow RKA Pdr.
Reduced at 130° F. 12 min.
60 gals. water
16 lbs. caustic
16 lbs. hydro
After reducing 12 minutes, add 34 lbs. acetic acid 56% slowly while stirring
Spring machine at 130° F.
25 lbs. Peregal 0
Add color in two parts 10 min. shifts
Run 20 min. longer. Add:
16 lbs. caustic—dissolved—add in four shifts of 5-min. intervals. Run 10 min. longer, drop
Rinse clear of caustic. Oxidize at 130° F.
1% Perborate
Raise to 195° F. soap 15 min.
3 lbs. Igepal CTA
3 lbs. soda ash
Hot wash. Cold wash

They have dyed over 100 beams of this shade of Maize by this procedure and all dyeings were perfectly level.

Recent actual mill run using a modified Kupensaure method show it to have extremely interesting possibilities for the dyeing of spun rayon. This modification allows the Kupensaure process to be run on a practical scale because it is not necessary to adjust the pH. This new change in process is as follows:

The organic acid is circulated in the machine and the reduced dyes added in four portions. The acid-leuco takes place, therefore, in a larger volume and evidently a perfect balance occurs every time with very little technical attention, thereby putting the method on a more practical plane.

20/2 spun rayon was used for stock, and 5% Jade Green double paste applied.

The following is a practical formula:

100 lbs. yarn
Circulate 9.50% Acetic Acid 56% conc.
4.00% Glue
@ 90° F.
Add in four portions, 6 minutes outside and 3 minutes in, the reduced dye, prepared as follows:
4.00% Jade Green double paste
1.00% Tamol NNO
3.00% Caustic
3.00% Hydro
Reduce @ 140° F. 15 minutes 1-20 volume
Then re-reduce by adding to the machine in three parts, 3% Caustic and Hydro, running 10 minutes out, 5 in and 10 out.
Raise temperature in 30 minutes to 180° F. (outside), to improve penetration, and finish as usual, rinse, oxidize, and soap.

Inspection of actual packages dyed by the above method shows excellent penetration and levelness. We, therefore, think that this new technique of the Kupensaure opens up greater possibilities for its use.

Conclusion

Experimentally we have been unable to predict from a laboratory filter test whether a vat color will dye by the Kupensaure process. Whether a dyestuff filters easily or poorly is dependent upon the dispersing agent added by the manufacturer. Dyestuffs showing poor filtering characteristics can be improved by the selection of a good dispersing agent or even a retarding agent. Dyeing technique in the use of the Kupensaure process is essential, especially in the careful control of pH and the slow careful addition of the caustic when returning to the alkaline reduction.

The chief advantage in the use of the Kupensaure process is from actual mill reports on Green and Vat Yellow which show it to give more uniform dyeings throughout the package than by any other method of vat

dyeing. The dyeings are more uniform from batch to batch.

The Kupensaure process has shown itself to be useful in the cases outlined above. There is no question that when this process is more generally tried out in this country, many advantages can be obtained when using this method of application. Plants having present difficulties with the leveling of pastel shades and those seeking maximum color value of certain formulas should check the list of the dyestuffs most suited to the Kupensaure process and check this method against their present practical application formulas. The success of any new or changed method of application depends entirely upon the resourcefulness of the dyer and chemist in charge. A survey has already shown that some plants have been successful and others fail when using the same processes. This method can only properly and practically be evaluated when checked against existing methods in a practical manner.

Furthermore, it is well known that in applying certain vat colors, regardless of the method of dyeing, rather high percentages of retarding agents are necessary assistants to the dyebath, in order to obtain levelness. These retarding agents, when used for the purpose of leveling vat colors, tend to retain in the dyebath, a certain percent of dyestuff which will not exhaust onto the material. By using the vat acid, or Kupensaure process, the acid vat solution may be added to the machine and leveled well throughout the batch. The dyestuffs having little or no affinity in this form penetrate and distribute evenly throughout the material. By following this procedure of dyeing, as the vat acid bath is reconverted, it is possible to regulate a slow and almost complete exhaustion of the dyebath.

Although many practical formulas have been set up and are running without the use of retarding agents in the dyebath, it is almost impossible to dye certain shades without the use of proper retarding agents. The vat acid procedure will not eliminate the use of retarding agents entirely but will in many cases allow them to be reduced. On vat colors that may be used by this process it gives us an added means of applying these colors in a more level manner. The formula listed shows that on an extremely light shade in beam dyeing, the use of a retarding agent, along with the vat acid method, was necessary to produce levelness.

To date, this process has found use in aiding a number of plants in producing certain dyed shades to a better degree of uniformity than by using their past methods. An outstanding example regarding the value of this process in special cases is shown when dyeing a light shade of Vat Golden Yellow RK on beams and packages. Although this dyestuff is classified as a cold dyeing type and normally levels exceedingly well, it has been very difficult to dye it level on tightly wound beams in very light shades. Comparisons made by dyeing this dyestuff by the pigment method or the regular reduced method, and the vat acid method, showed that the latter process produced the most level results throughout the beam.

In checking as far as possible many practical demonstrations that have been made to date in the plants that are now using the process on special shades and colors, it is very apparent that this method will not revolutionize our present procedures, nor is it entirely adaptable to the wide range of vat colors on the many machines and fabrics that are being processed. It is important to note that it does add to our regular procedures, a new method which in many cases will solve a problem in the application of certain dyestuffs to a better degree than the present methods in use. A process does not have to be universally adopted to become an important asset to our present methods of application. This method certainly has thrown a new light on what can be done with vat colors. Further investigation may well prove that by the use of this process or variables of the principles involved, additional future problems, in the field of application, may be more easily solved.

Acknowledgement

Acknowledgement is made to the following companies for the aid that they have given with their laboratories and personnel in making this paper possible:

Calco Chemical Division of the American Cyanamid Company, Charlotte, North Carolina

National Aniline Division, Allied Chemical & Dye Corp., Charlotte, North Carolina.

Dyer S. Moss Company, Charlotte, North Carolina

E. I. DuPont DeNemours & Company, Charlotte, North Carolina

Ciba Company, Inc., Charlotte, North Carolina

General Dyestuff Corporation, Charlotte, North Carolina

Wiscasset Mills Company, Albemarle, North Carolina

Burlington Mills Corporation, Greensboro and Burlington, North Carolina Divisions

Threads, Inc., Gastonia, North Carolina

Union Bleachery, Greenville, South Carolina

Southern Franklin Process Company, Greenville, South Carolina

American Aniline Products, Inc., Charlotte, North Carolina

Charlotte Chemical Laboratories, Inc., Charlotte, North Carolina

—♦ ♦—

Testing for Fire Resistance—

(Continued from Page P140)

The net result was that the char along the eaves where the fabric was in several layers, ran all the way around the tent and effectively disabled the structure for its intended use. Our AATCC test makes no provision for testing this condition but we will get to it when we have the previously indicated variables under control.

Our committee is aware of the great importance of carefully selecting test samples in accordance with the best statistical methods. Decisions of acceptance or rejection must be based on test results and test results must be representative of the entire quantity of fire resistant fabric involved. A sampling procedure plan in which the sample selection is randomized must be used if test results are to portray the actual condition of the goods being tested. Buyers of fire resistant fabrics should insist on maximum protection through statistical analyses.

Most Likely Test

Now I would like to get back to that 6th factor governing the value of the test method. I said that the test might be more valuable if it duplicates under measurable conditions, the test most likely to be used by mills, converters, wholesalers, retailers, and customers while goods are in motion toward the market.

The test most likely to be used in textile channels is the test that probably everyone in this industry has seen at sometime or other. It is run as follows—cut a sample of any size from a fire resistant fabric, hold it vertically with one hand and set a burning match to it with the other hand. I think you may agree that as fire resistant textiles move throughout the country this simple test will be conducted most frequently and the results will be used as basis for decision. This does not de-emphasize the importance of a controlled test under controlled conditions but rather indicates a factor which must be recognized by all people who propose tests for fire resistant materials. If a machine test is less severe than the simple hand test then the risk involved

in depending upon the machine results, is obvious.

Committee Program

Our AATCC committee has an ambitious program under way at this time and we have the active support of the textile, chemical and plastics industries. Our committee members include people who have been inventing and patenting fire resistant finishes, people who have been investigating and testing fire resistant finishes, people who are applying fire resistant finishes, and experts in the resin and cellulose fields. If any of you people are interested in actively participating in our laboratory investigations I will be glad to talk it over with you. We have ample laboratory facilities at our disposal but we might arrange to bring a few more into the program.

Use of Terms

In closing I would like to say something on this matter of continually qualifying the use of the term "fireproof" when we refer to textiles. It is incorrect to say that a compound or process is recommended for the fireproofing of a textile. We are not able to make a textile fireproof in the exact definition of the term. Our closest approach to the absolute term "fireproof" is indicated by the keywords "fire resistant."

One of our members suggested that we might use a technique similar to that employed in connection with mildew resistance. Thus just as a mildew inhibitor is called a "mildewcide" a fire inhibitor might be called a "pyrocide." I rather like that idea but I am not sure whether the particular word "pyrocide" is being used by someone as a trade name.

I feel that if we start a campaign here tonight on the use of the word "pyrocide" to indicate "fire resistance" as distinguished from "fireproofing" we would see the word accepted quite rapidly. You know this R. I. section of the AATCC has a habit of starting successful campaigns.

We will have the motion picture now. The subject is "Flamefoil Canvas Protection," and we are indebted to one of our committee mmbers, Dr. G. E. Landt of Philadelphia Textile Finishers, for the opportunity to see this picture.

You will note the AATCC vertical test being run in two different laboratories. The pilot light equipment was not used however, and if you watch the picture closely you will note how the flame flickers as the operator tries to center it under the specimen. The use of a pilot light eliminates this variable.

At the close of the program I have a variety of fire resistant dyed and printed fabrics, fire resistant coated fabrics and fire resistant supported and unsupported plastic films which you might like to examine and discuss with me.

—♦ ♦—

Flammability of Wearing Apparel

(Concluded from Page P141)

The Yockers machine, as I said, differs somewhat from ours. The specimen rack has wider spaced, finer suspension wires, and the fabric is already voluminously aflame when it burns a lower cord which starts the measuring. This makes for much faster burning rates especially in sheer fabrics and of course would rule out many constructions which would pass in our tester and which are sold by the millions of yards and have never given cause to fatal accidents. Of course, this made for endless confusion and for that reason Mr. Baker of our committee went to Los Angeles three weeks ago to bring clarity into the situation and fortunately he succeeded in having the Fire Marshal accept the AATCC tester.

Mr. Yockers also has in his machine a device to test the relative flammability of plastic coated materials and unsupported films as used in aprons and certain rainwear and also articles of personal adornment made from flammable plastics. It is based on an electric heating element which is applied 3/16 inch from the specimen. Our committee has not as yet concerned itself with the testing of these materials, but we found Mr. Yockers' device not satisfactory for it. It is of course essential that a reliable test method for these materials should be devised. The Society of Plastics Industry is particularly interested in the former, the Plastic Materials Manufacturers' Association in the latter. Both are anxious to work with the AATCC on the problem and for this reason a new Sub-Committee under my chairmanship was formed three weeks ago which is headed by Mr. Bleegen of Firestone and has four members representing Plastic Manufacturers and Coaters and also two members representing Testing laboratories. They have set up with us an elaborate program to test unsupported films and coated textiles. A second Sub-Committee is under formation in collaboration with P.M.M.A. who will study the flammability of plastic adornments. You see how our job has snowballed.

It is of course highly desirable to have Federal legislation not only in order to stop possible confusion of individual state laws but primarily to give protection to the public and to stop claims on converters. Some of our committee members have for many months worked in an advisory capacity with legal councilors of N.R.D.G.A. who have set up a proposed Federal bill which is based on our Commercial Standard and which was recently introduced in the House by Congressman Arnold and in the Senate by Senator Capehart who have already been called before the Interstate Commerce Committee.

This bill has all the earmarks of being passed, but when enacted as a law it will not mean hardships to the industry. In the first place, only a very small percentage, probably not more than 1-2% of all textiles will be found vulnerable according to our test and these few can be continued to be manufactured as they can now be made flame-resistant without losing their character. Dr. Little has already told you about his process. Besides their "Ellicote," we also have "Ban-Flame" of Joseph Bancroft and Sons which effects a chemical surface modification of cellulose. B. F. Goodrich have very recently brought out their Permaproof 200, Monsanto have taken out three patents, stating that they may be able to market a new process in six months and DuPont have in their research development produced a process which our committee found most valuable. These five processes have all been developed since our committee commenced to operate, all undoubtedly stimulated by the publicity which this work created. Again it proves that progress in industry comes with necessity.

—♦ ♦—

Meeting Dates, Philadelphia Section, 1947-48

THE Philadelphia Section has scheduled meetings on the following dates at the Bellevue-Stratford Hotel for the 1947-48 season:

September 26, 1947.....North Garden
November 8, 1947.....Ball Room
(Twenty-fifth Anniversary of Philadelphia Section)
January 16, 1948.....North Garden
February 27, 1948.....North Garden
April 9, 1948.....North Garden
May 21, 1948.....North Garden

Moiré Finishing of Today's Fabrics*

HANS A. HOLTERHOFF, B.T.C.

Secretary and General Manager
Newburgh Moire Co., Inc.
New York, N. Y.

I. Introduction

IT is my purpose here tonight to describe the processes used to produce this lustrous finish you see upon the fabrics displayed here. Also, to refute the dictionary's definition of moiré as being "watered silk" and to deny that the encyclopedia's description of the process—to run wet goods through a calender—is correct.

Particularly, however, I would like to acquaint you with a few practices that may prove helpful, should destiny care to beam upon you, some time or other, and bless you with the chance to prepare a lot of moiré.

Moiré is, after all, just another finishing process. Its origin dates back practically to the origin of cloth itself. I've heard of Chinese wood-cuts showing how moiré was processed thousands of years ago. It is evident in practically all pictures of Roman Church vestments back through the ages: has been in the public eye as long as three generations that my own forefathers can recall. You will find it today in Sears Roebuck catalogs as well as on Fifth Avenue.

In the United States, the processors have an interesting history. At least five moiré experts were imported from Como, Lyons, and Krefeld under the protection of the McKinley bill. About 1900, 10 years later, they merged into a single combine. This was the Silk Finishing Company of America. That was before the popularity of piece-dyeing. When the large piece-dyers came along, like National Silk Dyeing of Dundee Lake, they started their own moiré departments till in 1930 we find 5 such large combination dyers-finishers involved in the process, National Silk Dyeing alone being known to have turned out over 100,000 pieces in one year. Today, as taffetas and bengalines return slowly to the post-war market, we find the bulk of the moirés being handled again by independent moiré specialists who broke away from dye-house control, and are free to handle any fabrics on the market, regardless of where they were dyed.

* Presented at meeting, New York Section, November 22, 1946.

II. Description of the Moireing Process

1—Basic Principles:

In describing a moiré, we speak of the predominant characteristics which are: *First:* the luster . . . *Secondly,* the lines or shadows upon the lustrous surface which give the finish a defined pattern. Roughly speaking, the whole is achieved quite simply, by laying two identical fabrics face to face, subjecting them in that position to simultaneous pressure and heat. Either a hot calender, or a steamheated hydraulic press will do the trick.

When the two layers of fabrics consist of a heavily ribbed material, and the filling threads are laid straight and respectively parallel, it will be found that the action of the calender will force the thick threads of one cloth into the recesses between the threads of the other. and that where this is accomplished, the result will be a brilliant luster after the two have been pulled apart. *That* is how the luster is achieved.

If, on the other hand, the respective filling threads are only approximately parallel, but cross each other on occasion, then the action of the calender will flatten these threads at the points where they intersect, in addition to producing the luster in those other areas where the threads lie exactly parallel. These combined effects cause what is generally called, "a Pattern." The patterns can be controlled, within limits, by regulating the lay of the filling.

2—The Moiré Processes

There are a number of different methods employed to produce a moiré, and each of these produces its own peculiar style of patterns. There is the Pekin, the Antique Velour, the Pick-on-Pick, and two others which I wish to describe more fully, namely: a-Francais (also called Bar Moiré), and b-Scratch Moiré.

A—The goods are run up on a beam, doubled, while retarding certain sections of the filling, as they pass a fixed point. This operation is called "tracing," and produces a pattern in which all the lines run warp-wise. This style of moiré is called "Francais." The shiny areas between the lines are called bars. If it is desired to trace twenty bars on a given fabric, the pattern will be designated as "Twenty Bar Francais."

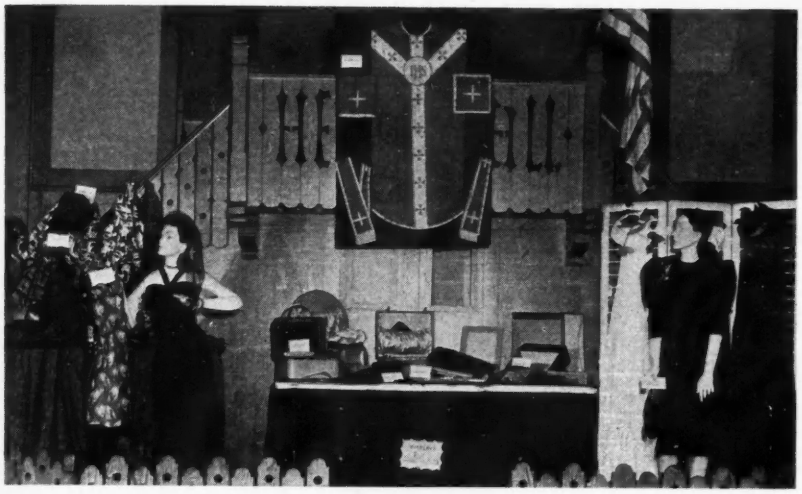
B—The second popular method is known as "Scratch" method. It permits the production of figured patterns such as teardrops, flowers, tropical palms, Mexican hats, etc. In this process the fabric is doubled, as before, then run through a so-called scratching machine, an affair which crudely resembles a roller printing machine, having an engraved roller composed of rubber. Bearing against this engraved roller, and revolving at a greater speed, are a series of scratch blades, set into a scratch roller along the lines of a lawn-mower. The doubled cloth is run between the scratch blades and the engraved rubber roller, and the filling of the fabric is shifted in those places where the blades find resistance in the raised places of the engraved rubber roller. Although only a limited number of fabrics are suitable for this method, principally 200 and 300 denier taffetas, and selected tie-silk failles, it has been extremely popular since its adaptation to the acetate taffetas a few years ago.

Still other patern styles, such as Pekin, Antique, Mirroire and Velour are achieved by use of special equipment, such as mangles, plate presses, etc, and are still in occasional demand, but require, as a rule, cloth especially woven for the purpose: usually skein-dyed.

3—Suitable Fabrics

The filling of the fabric produces the pattern. The warp develops the luster, but requires the right amount of backing from the filling. It is easy to see, therefore, that each and every different type of weave, each and every different type of yarn, and each variation in the count of picks per inch gives a different appearance to any pattern. The following standard constructions have been particularly popular as Moiré Fabrics, and are here given in the order of their popularity:

1—Taffetas



Display of Moiré Finished Fabrics at the New York Section Meeting on November 22, 1946. This display was arranged by Samuel A. Goodstein, Sales Manager, Newburgh Moiré Co., Inc.

2—Bengalines
3—Poplins
4—Faille Crepes
5—Jaquard Failles, Tinsel Failles, etc.

Delustered and pigment yarns cause the moiréd cloth to have a soft, suede finish, which is quite attractive in itself, and desired by some. However, these yarns do not permit a high luster moiré, and prove disappointing to the customer who wants a pronounced pattern.

It has been known for a mill which is not competitive with the quality of its weaving, to schedule its entire production for moiré, chasing the warp through its looms irregardless of reed defects, warp streaks, tight ends and similar irregularities, letting the moiré cover the defects, and permit the sale of the fabric as firsts. The Junior Luana, which has a sleezy warp and a thin, irregular spun rayon filling looks impossible in its natural dyed state. With a moiré finish, however, it is fit for display in any Fifth Avenue shop. Many converters will make it a point to buy selected mill imperfects, and convert into firsts with Moiré. However, bulk of the business is still regular mill production, scheduled through dyeing, then to moiré.

On the table, here, is a fair collection of fabrics, showing the cloth before and after moiré. You may notice that some have a stiff finish, others a water-repellent, who knows, what all. Well, as long as its not a delustered finish, or one which turns too boardy when heated, the moiré will work out all right on top of most ordinary finishes.

If in doubt as to whether a fabric will moiré or not, it is advisable to send in a ½ yard sample for a test, to see how the luster will develop. The ½ yard is for luster only, and should not be expected to be a presentable moiré pattern, for use as a sample. To produce a good sample, with even the simplest pattern, requires about 10 yards, and is as much work for the moirér as finishing a 200 yard lot.

4—Fastness Properties of the Moiré Finish.

Silk (Failles, Taffetas, Bengalines) Satisfactory to pressing, will resist careful dry cleaning. Not fast to washing or redyeing. Used extensively in dress fabrics, linings, cravats, drapes, and upholstery fabrics. Often seen in the upholstery of museum pieces, and ancient ecclesiastical robes.

Rayon-Cotton Bengalines: Satisfactory to careful pressing, but recommend extreme care in dry-cleaning. Not fast to water or rain spots unless water-repelled. Popular in drapes, decorator's items, ladies wear, novelties and trimmings.

Acetate Fabrics of all kinds, including mixed fabrics which have an acetate warp. Excellent fastness to dry cleaning, pressing, silk washing, cold water. Popular in dresses, cravats, linings, bathing suits, vestments, upholstery, umbrellas, raincoats.

Rayon Fabrics: Not fast to any steaming or dry-cleaning treatment, unless water-repelled. Used primarily in linings.

Nylon Fabrics: Excellent fastness to pressing, ironing, and laundering. We have no record of other tests having been made, since the item is a new one. At present, they have been moiréd for use in upholstery, draperies, and ladies undergarments.

III. The Dyer's Problems

Just like a dyer's troubles in trying to penetrate an impenetrable fabric, to dye a rhodamine shade on cotton bengaline, so, also, does the moirér have his troubles, which eventually kick back to either the dyer or the converter, and they are peculiarly unexpected and interesting.

1—No Match:

Every converter who has ever sent out goods to be moiréd is familiar with this term. It is used by the moirér to describe a certain condition which renders an otherwise perfect piece of fabric unsuitable for moiré. It is most prevalent in acetate taffetas, but may be found anywhere.

It is caused when the pick-count (Spacing between the filling threads) varies within a given piece. You may recall that 2 sections of equal pickage must be laid one upon the other to produce a good pattern. This cannot be done if the picks do not run uniform.

Where does it originate?

a—Uneven weaving, easily identified. Often found in heavy materials which are custom woven in short lengths.

b—Uneven tension on the jig. If jig operator does not loosen his tension blocks at the end of a roll, to compensate for the smaller diameter of the roll, the end pieces will be overstretched. This is the most common cause on acetate taffetas.

c—Overstretching on drying cans. Acetate taffetas are especially sensitive to tension when hot.

Remedies for No Match

a—An experienced converter will usually send along a few extra pieces to permit the moirér to substitute when he finds a "No Match" piece. For instance, if his order calls for moiréing 1000 yards, he will send along 1200, with instructions to return 200 plain.

b—An experienced dyer, when given a large dye order of which a part is for moiré, will select the center pieces from his dye rolls, scheduling all end pieces to be returned plain. In this manner, he can guarantee his work 100 per cent suitable for moiré.

c—Naturally the above are expedients for a normal dye job. It can be avoided to a great extent by careful dyeing and handling, as well.

2—Short lengths:

To get his two pieces of material of exactly equal length, the moirér usually

has to cut his original pieces in half. Then he is sure to have suitable sections for his process, using the two halves as mates. Clip holes, thick nubs, seams, rip, miss-clips get worse, when through a calender, as you can imagine, but worse yet, mirror off on the companion piece, and end up a much greater damage than the original condition would indicate. Pieces intended for moiré must be carefully framed, free of wrinkles.

The working loss, therefore, on torn fabrics and short ends can be extremely high, in addition to being a very expensive operation for the moirér, because of stoppages and patching on the calender.

At least 10 yards are required to run a moiré sample, on a given pattern. To produce such a sample, one that is representative of the finished product, requires as much time and effort as it does to process a hundred yards. A sample or pattern should never be requested unless absolutely necessary.

A different thing, entirely, however, is a test, to see if a given fabric will take a moiré. A test of this nature requires only a few minutes, requires a half yard of material, and shows clearly the luster and appearance of the lines to be expected on that piece of cloth. However, it is not fit to be submitted to a customer, or to be used in the construction of sample articles.

3—*Loss, Shrinkage, and Gains in moiréing*, depend on the following:

a—*Condition of the cloth.* See Paragraph above. With short ends, a lot of seams, may run as high as 5 per cent.

b—*Type of Fabric.* Bengaline, for instance, box-dyed for a 10 per cent shrinkage, will gain in the moiréing process, gains as high as 5 per cent are a common experience. Strangely enough, the hand improves along with the gain in length.

Acetate Taffetas 300 den. show a slight gain, as a rule. 200 dens. break even, while 180 dens and under generally show a working loss, which may be as high as 2 per cent.

c—*Dyers' handling.* Often a customer will split his goods between two dyers. . . same quality, same cloth. . . Both lots go to the same moirér. One lot gains, the other shows a loss. Depends on how much they were stretched in the dye-house.

The moirér will send the goods out with a gain wherever possible. He is interested in promoting moirés, and making it worth-while for the customer to moiré his goods.

In addition, a piece which has been overstretched in the dye will not moiré nicely. The luster will appear flat. The pattern will be less pronounced if it is a scratch pattern. In a bar Francais, the pattern will show less lines.

4—*Covering of faults.* Moiré finish covers a multitude of sins. The following defects are generally covered by the moiré to a great extent, sometimes even eliminated completely:

a—reed defects, uneven warp.

a—Tear-drop defect caused by bruised yarn.

c—Shiners, tight ends.

d—In screen or roller printed fabrics, uneven appearance of blotches.

e—Finish streaks and blotches.

d—Accidental moiré caused by jig dyeing.

e—Lousy goods, containing dye-resist linters.

—♦ ♦—

Winter Meeting, Piedmont Section

THE Winter Meeting of the Piedmont Section was held at the Poinsette Hotel, Greenville, S. C. January 25, 1947.

Edwin L. Jones, Executive Vice President of J. O. Jones Construction Co., Charlotte, N. C., was the banquet speaker. His subject was "Oak Ridge from the Inside."

A technical session was held at three o'clock P.M. The general subject for discussion was "The Production of Fast Shades on Mixed Fibers." These papers were presented as follows:

"Dyeing Fast Shades on Piece Goods Containing Cotton for Viscose Rayon Mixed with Wool" by Larry S. Thompson of General Dyestuff Corp.

"Dyeing of Fast Shades on Piece Goods Where Nylon and Acetate Are Mixed With Wool" by Harry Clapham collaborating with Robert Turner of Dupont Co.

"Dyeing of Fast Shades on Yarns Containing Mixed Fibers as Cotton, Wool, Nylon, Acetate, Viscose, etc." by Ormand W. Clark, Calco Chemical Division, American Cyanamid Corp.

Following these papers an open Forum Discussion was held under the direction of James Harrell of Ware Shoals Division, Riegal Textile Corp.

Respectfully submitted,
ROBERT H. SMITH, *Secretary*

—♦ ♦—

North Carolina State College Student Chapter Meeting

THE Student Chapter at North Carolina State College presented W. B. DePass, Southern Manager, Interchemical Corporation and Mr. Adair, Technical Representative of Aridye Corporation on February 28 to the four classes of Textile Chemistry and Dyeing students. The subject of the lecture was "Printing with Aridye Pigment Colors." During the talk, Mr. DePass demonstrated the use of various types of emulsions and solvents, method of mixing a printing color and the process of printing on machines and on screens.

The historical background of pigment printing dates back to one of the oldest art of decorative textiles. The print paste is composed of finely grounded pigment color, organic solvent, water and a concentrated "clear" (unpigmented resin solution), when prepared for a printing machine. Pigment colors alone consist of a high concentration of pigment dispersed in an organic solvent solution of a synthetic resin. Pigment colors are applied on ordinary roller printing machines, after which the fabric is dried and then the resin is polymerized by heat curing. Time and temperature required depend on type of fiber and other factors.

The Aridye pigment colors of the 400 Series may be used for printing cotton, rayon, nylon and other fabrics.

Mr. DePass pointed out several advantages of the colors.

Samples of pigment printed and dyed materials were passed among the students by Mr. Adair during the lecture. Also photomicrographs were observed showing degree of penetration of pigment into or on surface of printed and dyed samples.

A general discussion with questions and answers followed the lecture and demonstration.

Respectively submitted,
ELIZABETH FRAZIER, *Secretary*

EMPLOYMENT REGISTER

(Full details on applicants are available from the Secretary).

47-23

Education: High school and part college.
Experience: 17 years, mainly with one company, application laboratory work on variety of dyes and fibers, including printing and resin bonded pigments, with executive responsibilities.
Age 36; married; references; will go anywhere in U. S.

47-24

Education: High school, and courses in R. I. School of Design.
Experience: Boss dyer, wool raw stock, cotton.
Age 50; widower; references from all employers; will go anywhere in U. S.

47-25

Education: Lowell Textile Institute, graduate, textile chemistry and dyeing, 1932.
Experience: Eight years textile chemist and colorist in print works; inspector for Quartermaster Corps, Army of U. S.
Age 36; married; references; position as chemist or salesman in New England preferred.

• PATENT DIGEST •

PAUL WENGRAF

Urea-Formaldehyde Condensates Stabilizing G, 2, 01

U. S. Pat. 2,406,217-18 (Harvel Research Corp., Harvey-Caplan, May 20, 1946)

Urea-formaldehyde pre-condensates or condensates are known to be rather unstable in aqueous solutions. With regard to the increasing importance of these substances, particularly for textile treating purposes, it is very interesting to note, that a new method of stabilizing the aqueous solutions has been found. The authors mention the glycol-stabilizing method (see here below). These condensates are said to lack stability when dissolved in water because of the high water-solubility of glycol itself. The present patents propose to prepare pre-condensates of *formaldehyde and tert.-butyl., tert. amyl- or tert. hexyl-urea* and the like by refluxing them in ammoniacal solutions. The condensates thus obtained are very stable and do not change their viscosity in months. They have moreover the advantage to stabilize the usual aqueous solutions of *unsubstituted* urea with formaldehyde when added to the liquids, mentioned here above. It was still more economical to condense in the same operation urea and alkyl-urea with formaldehyde. Investigation of stabilities of the usual condensates, compared with those according to the present invention gave the following results:

(a) without alkyl-urea	*(b) with alkyl-urea*
60 g Urea	60 g Urea
275 g Formaldehyde 37%	275 g Formaldehyde 37%
3 g Ammonia 26%	3 g Ammonia 26%
	18 g Tert-amyl-urea

Solution (b) was stable for 2 months; solution (a) was transformed into a gel within two weeks. The authors quote as a method for preparing tert.-alkylureas their own U. S. P. 2,247,495 (1941), describing a treatment of urea with concentrated sulfuric acid, keeping the temperature low (70° C) and reacting this mixture with tertiary aliphatic alcohols at very low temperatures.

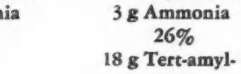
References: U. S. P. 2,403,450 (Sharples Chem.) recommends to prepare alcohol-soluble resin condensates by condensing urea and formaldehyde simultaneously with alkylurea, having an alkyl between C 3 and C 8. An example is the product, obtained by refluxing formaldehyde in an ammoniacal solution first with butylurea and thereupon with urea. No reference is made to the special tertiary -alkyl subst. ureas, mentioned in this patent. U. S. Patents 2,374,647-648 (du Pont) use Methoxy-methyl urea as a resin forming agent. The glycol -modified urea-resins are for instance protected by U. S. Pat. 2,377,422 (Reichhold Chem.). They are known as stable condensates, having the tradename "Beckamine."

Nylon—Sizing with Dioxolane Condensates A, 4, 01

U. S. Pat. 2,406,749 (du Pont—Dittmar—Sept. 3, 1946)

It is known that sizing of nylon yarn is a very critical operation. Good knitting performance, even under moist conditions, and good stitch formation are required. Moreover the goods should not show a tendency of edge rolling. The present specification quotes a former patent of Spanagel (U. S. Patent 2,324,-601), likewise assigned to duPont, in which the use of polyvinyl-acetate, modified with boric acid, has been proposed. But also this method is said to be not quite satisfactory under conditions of high humidity. The inventor proposes in his present patent to combine a boric acid modified polyvinyl acetate with a dioxolane polymer such as the sebacate or adipate. This composition gives very well running properties to the yarn when knitted and probably also when woven.

References: Dioxolane has the formula



O - CH_2-O-CH_2-CH_2 and is therefore a simple cyclic and very reactive compound. It has also been proposed according to U. S. Pat. 2,395,265—also assigned to duPont—as a mercerizing assistant and as a plasticizer and according to U. S. P. 2,395,971 (duPont-Loder) for solubilizing fatty acids or fatty acid esters. Here the dioxolanes are condensed with the fatty products by using sulfuric acid as a catalyst.

Zinc Soaps—Flameproofing Agents G, 2, 03

U. S. Pat. 2,406,779 (U. S. Rubber Co.—Kurlychek—Sept. 3, 1946)

Relatively light weight fabrics containing *predominantly but not entirely* asbestos fibers are flameproofed according to the present patent. Fabrics consisting entirely of asbestos fibers are fire resistant of course but they are either relatively thick and heavy when formed from short fibers or too expensive when woven from long asbestos fibers only. A fabric, containing as little as 25% cotton will burn lively when ignited. Fabrics of this kind containing an appreciable amount of combustible fibers have up to now been made flameproof by a sodium silicate treatment (or a silicon oxide depositing treatment) but the silicon compound does not cling firmly to the organic filaments. The patent proposes to use as an impregnating agent a water insoluble metallic soap, heating the impregnated fabric up to the melting point of the soap which is fused in this process. As a special example a zinc soap of cocoanut oil fatty acids, known under the tradename "Laurex" is proposed as a flameproofing agent. A preferred method is said to consist of a pre-treatment with a stannate, followed by an aluminum sulfate impregnation and as a third step the material is padded in a 4% dispersion of "Laurex" in an ammoniacal solution. "Laurex" fuses at about 100° C. In this way the soap is equally distributed over the whole fabric which is not only flameproof but also water resistant.

References: Metallic soaps generally used for making fibers water repellent are zirconium or aluminum soaps (see numerous publications, for instance U. S. Pat. 2,344,926, Rohm & Haas); U. S. Pat. 2,328,431 (Gen. Aniline) recommends zirconium soap emulsions, U. S. Pat. 2,250,483 (Hopkinson) emulsions of zinc salts mixed with rubber derivatives. The zinc-aluminum soaps, according to the present invention, have the purpose to combine water-and flameproofing effects, a problem which has often been discussed up to now. U. S. Pat. 2,052,886 (Brick-Trust) protects a water- and fire-proofing method by applying first a metal soap and thereupon a phosphate-borate. Insoluble zinc salts such as zincphosphates have a certain flameproofing effect as disclosed in U. S. Pat. 1,902,803 (Williams).

Polyamide Fibers, Dyed with Sulfur Dyestuffs C, 4, 07

French Pat. 906,232 (I. G. Farbenind. A. G.—Dec. 27, 1945) (acc. "Teintex" *) (1946 p. 230)

It is possible to dye polyamides and polyurethanes in dark shades with sulfur dyes by maintaining the dye liquor at a pH

between 5 and 11. The best way to operate is to dye from a sulfur dye solution, prepared not with sodium sulfide as usual but with alkaline hydrosulfite, adding thereupon an organic acid until the desired pH-value is reached. Instead of an alkaline solution of hydrosulfite an ammoniacal one can be used as well. This discovery is said to enable the use of cheap sulfur dyestuffs for this group of fibers instead of relatively more expensive brands.

References: Vinyon fibers can be dyed with different groups of dyestuffs, amongst others also with sulfur dyestuffs, according to AMERICAN DYESTUFF REPORTER Feb. 22, 1946, p.. P194 (Woodruff). Generally dyestuff groups, other than acetate dyes, have been proposed for dyeing polyamide fibers: azo dyes, containing copper complex salts, according to U. S. Patent 2,374,106 (duPont); direct dyes after a cation active pre-treatment according to U. S. Pat. 2,371,536 (duPont) or also after a diphenyl guanidine acetate treatment according to Brit. P. 570,602 (Courtaulds). Hydrosulfite is mostly used instead of sodium sulfide for dissolving sulfur-dyestuffs of the hydron-blue-group.

Stilbenic Acid Derivatives as Permanent Finishing Agents G, 2, 01

French Pat. 905,534 (Geigy Comp.—Dec. 6, 1945) (acc. "Teintex" 1945 p. 231*)

Aminostilbenic acids, combined with triazines (example melamine) and condensed thereupon with formaldehyde give water-resistant permanent finishes. Aminostilbene, $NH_2C_6H_4CH{:}CH.C_6H_5$, is transformed into its disulfonic acid derivative and this compound linked to melamine or another triazine. The formaldehyde condensate of these rather complicated substances have very interesting properties: they have a marked affinity to cellulosic fibers so that they combine with the fiber even during a short washing or padding process. Another unexpected advantage is their slight bleaching action on yellowish fibers although the substances seem to have no special oxydizing nor reducing properties.

References: Gen. Elect. (D'Alelio) obtained a great number of patents regarding resin-forming melamine (triazine) derivatives, combined with formaldehyde. Examples are here among others. Can. Pat. 432,794 (sulfamylanilino-triazine), U. S. Pat. 2,320,816 -20 (melamine + urea + formaldehyde) and so on. Other permanent finishes based on melamine are, for instance, products protected by the U. S. Pat. 2,390,476, 2,385,576 -66, etc. (Am. Cyanamid). As far as can be seen however the aminostilbenic complex seems to have a specific effect influencing and improving the shade of the fabric.

* Patent digests, contained in the recent issues of the French Magazine "Teintex" have been used for these abstracts, because the original specifications have not yet been received here.

Water Repellent Finishes—Zirconium Compounds in Alkaline Solutions G, 2, 01

French Pat. 905,659 (Deutsche Hydrierwerke A.G.—Dec. 11, 1945) (acc. to "Teintex" 1946 p. 261*)

Cellulosic textiles are made water repellent by treating them with zirconium-salts, dissolved in an excess of ammonium carbonate. According to an example the treating liquid consists of 70 g dry ammonium carbonate and 45 g Zirconium oxychloride, in one liter. The fabric is impregnated in a solution of this concentration on a jigger by passing it two times through this bath and drying it thereupon at 120° C. A permanent water repellent effect is said to be obtained. By adding a soap solution (sodium oleate) or some other softening agent the "hand" can be improved. The use of alkaline impregnating liquids is considered as an advantage of this method. —Reference is made to U. S. Pat. 2,402,857 (Titanium Alloy Man.), abstracted already in the AMERICAN DYESTUFF REPORTER, page 719, December 30, 1946. This patent suggests to use zirconium chloride solutions poured in an excess sodium carbonate solution.

Defoaming Washing Solutions C, 3, 01

U. S. Pat. 2,407,589 (Wyandotte Chem. Corp., Tremain—Bacon, Sept. 10, 1946)

The invention relates to the suppression of foaming in aqueous alkaline solutions, particularly when the washing solutions are strongly agitated. An increased temperature used in the washing operation causes remarkable difficulties by increased foam formation, which is especially promoted by a greater content of alkaliphosphates, frequently used at the present time in washing composition. The inventor found that small quantities of aromatic substances (minimum amount 0.01% of the washing agent) are able to reduce substantially the foaming tendencies. The aromatic substances recommended in this patent are *phenoxyethanols* (for instance. . . di-tert.- or p - tert-amylphenoxy ethanol) or diamylphenol.

Earlier work done in this field: Various groups of organic compounds have been described as foam suppressors. Examples are: U. S. Pat. 2,400,543 (Dearborn), see abstracts AM. DYEST. REP. p. 458/1946. Some other references, not yet mentioned in this abstract may be added: U. S. Pat. 2,074,380 (National Aniline) suggests to use tertiary amines, for instance triamylamines, also alkylarylamines. French Pat. 793.173 (Schacht): mixtures of fats with esters, ketones or phenols, also cyclohexanols. Ger. Pat. 635,881 (Lehman & Voss): phosphatides such as lecithine. U. S. Pat. 2,085,709 (I. G. Farbenindustrie A. G.): a mixture of higher alcohols with paraffin oil, etc. etc.

Milling Acetate Cellulose Staple + Wool A, 3

U. S. Pat. 2,407,602 (Courtaulds Lim., Cluley-Allen, Sept. 10, 1946)

Cellulose acetate has, according to Brit. P. 356,681, the property of reducing the shrinkage of fibers, associated therewith. Irregular effects result therefore in milling cellulose acetate—wool fabrics. The inventors observed that they can obtain a satisfactory milling effect on those fabrics by *introducing a plasticizer into the cellulose acetate fiber*, prior to the milling operation. The plasticizer may also be added to the milling liquid or even to the dye bath.

This patent corresponds therefore to Brit.P. 575,072, abstracted in AMERICAN DYESTUFF REPORTER, p.475. In the meantime information was obtained that the German textile industry tried to use solutions of cellulose derivatives (such as cellulose ethers, cellulose glycollic esters) as milling assistants as described in Ger.P. 748, 632 (A. Th. Boehme).

Flameproof Coating—Polyvinyl-Metacrylate Derivatives G, 2, 03

U. S. Pat. 2,407,668 (Leatherman, Sept. 17, 1946)

A flameproofing agent, to be applied in form of a coating liquid consists of four components: (a) a *methyl methacrylate polymer*, having by itself no flame resistance, (b) *polyvinylchloride*, imparting elasticity to the methacrylate polymer; (c) *zinc carbonate*, being decomposed during ignition and giving off (by the influence of poylvinylchloride) a sufficient amount of carbon dioxide as a flame extinguishing agent while at the same time zinc oxide acts as a dehydrating catalyst and (d) pigments, a plasticizer, mixed with other ingredients such as fungicides (zinc naphtenate) and the like. Proportions are for instance: 7.5 p butyl methacrylate polymer, dissolved to 33% in xylene-butanol; 25 p vinyl chloride acetate co-polymer, 5 p tricresylphosphate (as a plasticizer), 3 p zinc carbonate.

References: U. S. Pat. 2,172,698 (Hoop-

er & Sons) uses in a fireproofing process a chlorinated vinyl resin, Zinc or mangan borate, chromium oxide and a chlorinated hydrocarbon. The inventor's U. S. Pat. 2,326,233 proposed to use for fireproofing fibers a combination of chlorinated rubber and zinc carbonate.

Laundered Articles—After-treatment C, 3, 01

U S. Pat. 2,407,635 (Engler, Hand, Koletzko, Sept. 17, 1945)

The process, described in this patent relates not just to a finishing treatment, but it has rather the purpose to give to laundered, worn out, roughened linen a better appearance. The laundered goods are reacted in the last step with a gum tragacanth- glycerine- sodium borate dispersion to which a *pectine- vegetable gum- glycerine* emulsion has been added. Probably a transitory improvement in the luster is intended because the specification suggests also to add a similar composition to the finishing mass during the starching operation.

Defoaming Different Solutions C, 3, 01

U. S. Pat. 2,408,527 (Petrolite Corpor., Monson, Oct. 1st, 1946)

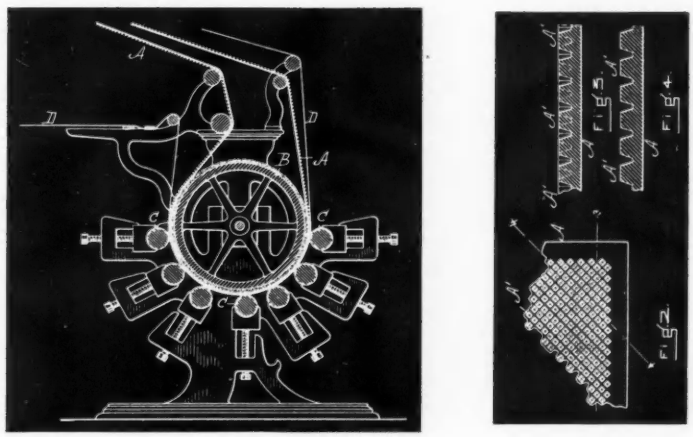
A mall quantity of a *condensate of polyaminoalcohols with higher fatty acids* is suitable for defoaming a relatively great amount of a washing, deterging etc. liquid, according to the present specification. The polyaminoalcohols are prepared by polymerizing triethanolamine, for instance by simply heating this compound whereby mixtures of dimers and trimers result.. [The formula of the dimer is in this case $(C_2H_4OH)_2NC_4H_2O.C_2H_4N(C_2H_3OH)_2$] The acids, applied in this process are preferably *unsaturated fatty acids,* having 18 C-atoms: oleic acid, linoleic acid, linolenic acid. For references see the abstract to U. S. Pat. 2,407,589 here above.

Textile Printing Blanket D, 3

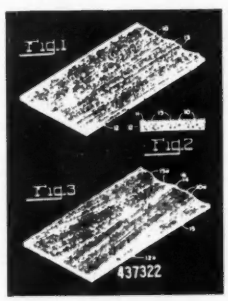
Canadian Patent 437,322 (Dewey and Almy Chem. Company, Ross-Neiley, Oct. 8, 1945)

This patent, like the other Canadian patents, is not available for public inspection. Apart from the claims, published in the Can. Pat. Off. Record, necessary details were received from the assignee to whom I wish to express my sincere appreciation. The company was kind enough to give the following information: Printing blankets bearing on their surfaces recesses and indentations to carry away the excess of the printing color have been proposed in a few older specifications. These indentations were formed by pressing numerous small integral points or projections into the rubberized cloth as long as the rubber was still in a soft and plastic condition. One of the oldest publications in this matter can be seen in Fig. 1-4 of the Brit. Pat. No. 25,598 A.D. 1897, assigned to J. E. Rodes of Boston, Mass. This form of printing blanket had the purpose to "produce a yielding but perfect contact and a complete absorption of the ink" (printing color). An increasing resistance corresponding to increased depression and compression was expected. This kind of printing blanket was improved as late as 1940, (U.S.P. 2,202,020 and U.S.P. 2,232,664) by one of the present inventors (S. B. Neiley). The patents provide cushioning layers in rubberized blankets. The blankets are prepared from *several layers* of rubberized double napped (raised) fabrics (see Fig. 1 and 2). Each of these layers has been impregnated separately. A considerable amount of rubber is held in the nap: the combined fabric is thus embedded abundantly in a rubber mass. The sheet coming in contact with the fabric to be printed (10) shows indentations, small grooves which act as a *kind of storage reservoirs* for the excess printing paste, migrating through the fabric and accumulating on the blanket. The blanket is thus covered with small patterns as illustrated in Fig. 3 of the U. S. Pat. 2,232,664. The present Can. Pat. offers still the advantage over these known forms to provide long channels pressed in the rubberized blankets instead of small indentations in square form or the like. It has been found that by this improvement the color was pushed in the

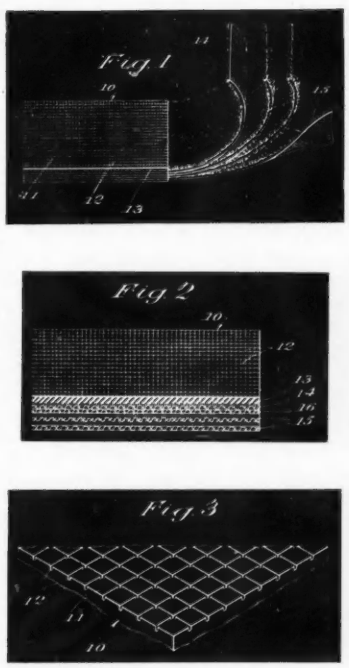
Textile Printing Blanket (British Patent)



Textile Printing Blanket (Canadian Patent)



Textile Printing Blanket (U. S. Patent)



direction of the axis of the fabric. The channels are either parallel or extending at an acute angle, carrying the excess color away from the goods. (See the enlarged Fig. 1 and 3 of the Can. Pat.) Both U. S. patents, as well as the Canadian patent, have obviously the purpose (as said in the U. S. Patent 2,232,664 page 1) to carry away the excess color which otherwise penetrates far into the blanket which, in time, becomes hard, brittle and cracks. So it is possible to dispense entirely with a separate gray blanket. The rubberized blanket is washed and dried, covered with some talcum and transported back in one operation to the roller printing machine. This innovation has therefore to be considered as a very important progress in the textile printing technique.

Flameproofing Composition—Treatment with Terpenes G, 2, 03

U. S. Pat. 2,407,988 -89 (Luckite Processes, Luckhaupt, Sept. 24, 1946)

Porous materials, especially cellulose, are made flame-resistant (quite generally also oil-, water- and rotproof) by a treatment with *terpenedihydrochloride,* $C_{10}H_{16}.2$ H Cl, a substance manufactured from terpin and HCl gas. It forms white to yellowish crystals, melting at 50° C. It is water insoluble and the impregnation is carried out by immersing the cellulosic material into the melted mass. Specific oil-, rotproofing, etc., agents may be added. The pores of the cellulosic fabrics are filled with the impregnating substance and the thus treated fabrics are suitable for any other superficial coating, lacquering, etc., purposes. Another substance, protected for similar purposes by the second patent, is *terebene,* having the formula $C_{10}H_{16}$, obtained from oil of turpentine and being a *water soluble liquid,* boiling point 160-172° C., in contradistinction to the above mentioned terpene dihydrochloride. The treatment comprises in analogy to the first patent an immersion for a short time. In some events additive substances, termed by the inventor as "fortifiers" may be added too. Especially cellulose acetate has to be mentioned here which improves still the flame- and fire-resistant properties.

References: U. S. Pat. 2,387,801/1945 (same inventor) disclosed that cellulose can be transformed into a solid, water- and heat-resistant material by treating it with molten terpene hydrochloride at temperatures above 300-400° F. The specification of this patent mentions already that the impregnated composition becomes flame-resistant but it suggests to increase this effect by adding ammonium phosphate, chlorinated waxes, etc., substances which are also termed as "fortifiers."

TRADE NOTES-NEW PRODUCTS

OBITUARY

CHARLES S. ROWE

Charles S. Rowe, 54, sales manager of the fine chemicals division of the Du Pont Company's Organic Chemicals Department, died March 1 in the Memorial Hospital, Wilmington, after a brief illness.

Mr. Rowe joined the Du Pont Company in 1919 and had been in his sales post since 1943.

A native of Volga, S. D., he received a bachelor of science degree in chemistry in 1917 from South Dakota State College and his master's degree the following year. In addition, he studied at Purdue University, the University of California and the University of South Dakota. During his undergraduate years he played varsity football with the South Dakota State team.

In 1918 he joined the Army and after receiving his commission as a lieutenant in the Air Corps he gave flight instructions at Army fields in Florida and Texas.

He joined Du Pont as a salesman in the Dyestuffs Division at the Chicago office. He remained there until 1923 when he was transferred to Bombay, India, to open an office there for the Dyestuffs Division. In 1930 he returned to this country, as assistant director of sales.

• Delta Kappa Phi Plans Convention

Delta Kappa Phi, oldest all-textile fraternity in America, will hold its 45th annual convention at the University Club in Boston on April 12, 1947. This year's convention is being sponsored by Beta Chapter at Lowell Textile Institute.

A business meeting will be held at 2:00 P.M. under the supervision of Supreme Consul John E. Foster. At 6:30 P.M., a banquet will be held. Representatives will be present from all Alumni and Student Chapters.

This will be the second post-war convention for the organization and plans are being made to surpass pre-war standards. It will also serve as a reunion of many members who have not been able to get together during the war years. A record attendance is expected.

Arrangements are under the supervision of the Convention Committee. Consul James R. King is honorary chairman; Roger P. Farren and John R. Godet are co-chairmen.

All members interested in attending may contact any of the Committeemen named at Lowell Textile Institute for reservations.

• National Cotton Week

The period May 19 to 24 has been selected for the nationwide observance of National Cotton Week, according to an announcement by the Cotton-Textile Institute and National Cotton Council, co-sponsors of the nationwide merchandising event.

The slogan will be "Pick Cotton" and will emphasize the return to store shelves of dependable supplies of the quality cottons which were scarce during the last five years. The announcement points out that production of cotton textiles has been rising since last April and is now proceeding at the rate of above ten billion yards per year.

• Stanalchem to Represent Dexter Chemical

Announcement has just been made that the Dexter Chemical Corporation has appointed Stanalchem, Inc. of New York as exclusive export representative for their Textile Chemical Division.

Stanalchem, Inc. has (with its predecessor) been engaged in the export business for the past eight years and has representatives throughout the leading industrial nations of the world. The organization has specialized in textile chemicals.

Offices of Stanalchem are at 11 West 42nd St. and 60 Broad St. in New York City. Dr. C. B. Quaintance is general manager and George D. Stehlin, export manager. Officers of Stanalchem, Inc. are, Louis H. Marks, president and Nelson Littell, secretary-treasurer.

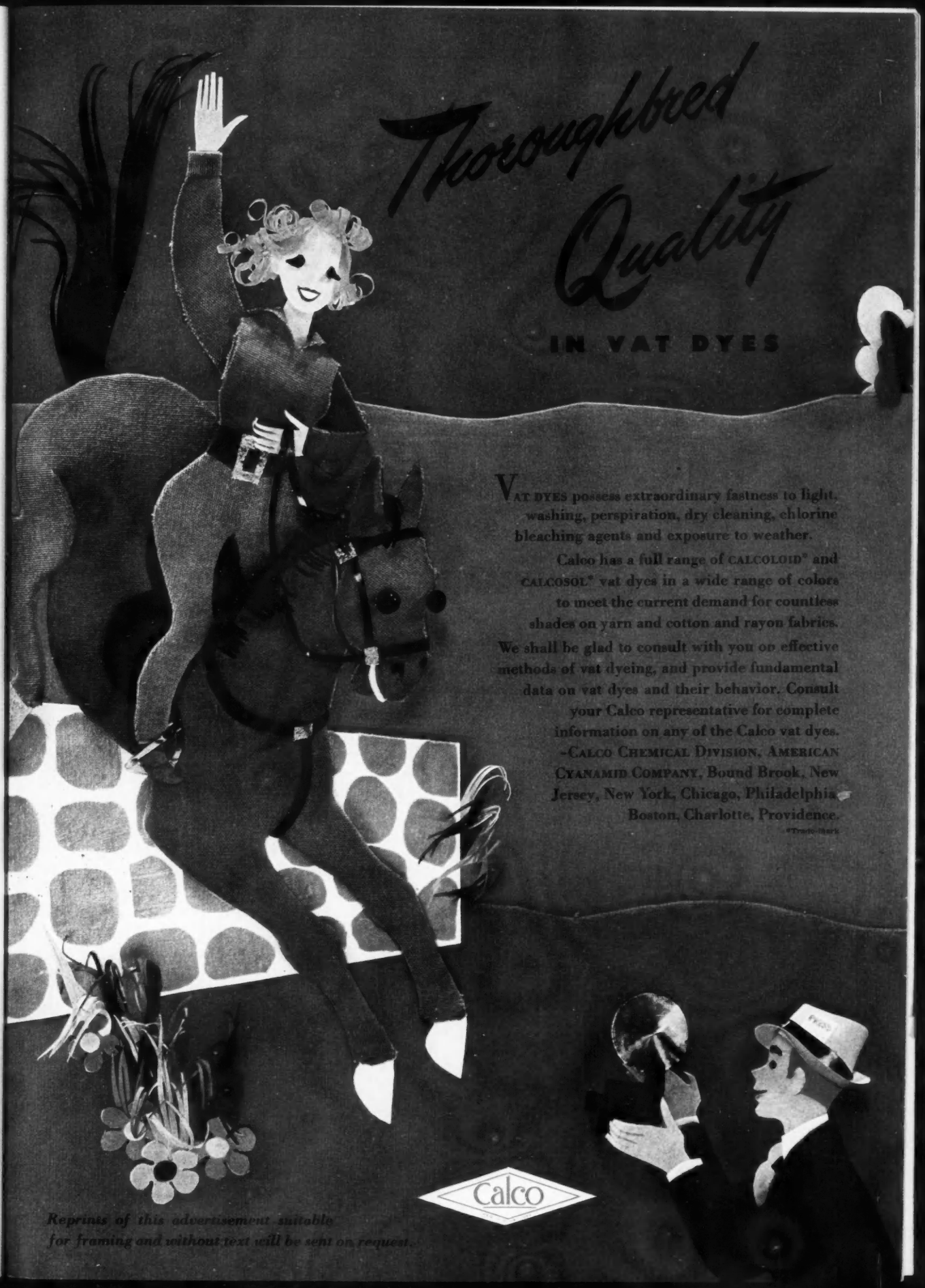
• Resigns from Brookside Mills

John J. Valter, Manager of the Finishing Division at Brookside Mills in Knoxville, Tenn., has announced his resignation in that capacity as of April 30th. Mr. Valter did not divulge his plans for the future.

Before coming to Brookside Mills, Mr. Valter was Plant Manager at North Carolina Fabrics Corporation in Salisbury, N. C.

He has been associated with the Textile Industry in the Dyeing and Finishing Field since 1929, and is a member of various organizations connected with the Textile Industry.

Knitting Arts Exhibition Number appears April 21, 1947


Thoroughbred Quality
IN VAT DYES
VAT DYES possess extraordinary fastness to light, washing, perspiration, dry cleaning, chlorine bleaching agents and exposure to weather.
Calco has a full range of CALCOLOID® and CALCOSOL® vat dyes in a wide range of colors to meet the current demand for countless shades on yarn and cotton and rayon fabrics. We shall be glad to consult with you on effective methods of vat dyeing, and provide fundamental data on vat dyes and their behavior. Consult your Calco representative for complete information on any of the Calco vat dyes.
-CALCO CHEMICAL DIVISION, AMERICAN CYANAMID COMPANY, Bound Brook, New Jersey, New York, Chicago, Philadelphia, Boston, Charlotte, Providence.
®Trade-Mark
Calco
Reprints of this advertisement suitable for framing and without text will be sent on request.

He's the famous ATCO trademark, known throughout the textile industry as a guy that tackles any and all textile finishing problems... makes the "hard ones" look easy!

ON ATCOSYN—

He represents a new synthetic, organic detergent that's better for scouring or boiling off all types of fabrics!
Ask for complete ATCOSYN data!

ON ATCOFIX D—

He represents the best, the surest way to prevent bleeding into white on direct dyed ground colors which are to be discharge printed!
Ask for complete ATCOFIX D data!

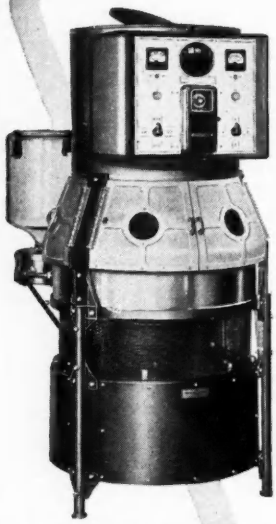
ON ATCO GF—

He represents a clear colorless, odorless liquid that STOPS atmospheric fading on dyed cellulose acetate fabrics.

Use ATCO Products

Atlantic Chemical Co., Inc.
MAIN PLANT: CENTREDALE, RHODE ISLAND
BRANCH OFFICE: PATERSON, NEW JERSEY

FADE-OMETER



• For over twenty-five years the yardstick of the Textile and Dyestuff industry for determining the light fastness of materials.
An indispensible machine for proving the light fastness of dyestuff and fabrics. Fade-Ometer tests are required by many government specifications.
Specimens are rotated around the Atlas Enclosed Violet Arc—the closest approach to natural sunlight. Temperature and humidity regulated—fully automatic in operation—perfectly safe to operate unattended over night.

ATLAS ELECTRIC DEVICES CO., 361 W. Superior St., Chicago 10, Ill.

ATLAS-OMETERS
Weather-Ometer ★ Fade-Ometer ★ Launder-Ometer

IDAHO Potato Starch

"THE FINEST MADE"

MAGIC VALLEY PROCESSING COMPANY
OF IDAHO
•
ST. ANTHONY STARCH COMPANY, INC.
OF IDAHO
•
MENAN STARCH COMPANY, INC.
OF IDAHO

DISTRIBUTED BY
AMERICAN KEY PRODUCTS, INC.
15 PARK ROW • NEW YORK 7, N. Y.

COMMONWEALTH
COLOR & CHEMICAL CO.

More than thirty years' experience in the manufacture of Chemical Specialties, Dyestuffs and Dyewoods for the Textile and Allied Trades . . .

MAIN OFFICE AND WORKS:
NEVINS, BUTLER and BALTIC STREETS, BROOKLYN 17, N. Y.
PHILADELPHIA • CHICAGO • GLOVERSVILLE • MONTREAL

LeaTex

The name that means leadership in

CHEMICAL SPECIALTIES

for the
TEXTILE INDUSTRY

"Always Reliable"

LEATEX CHEMICAL COMPANY
2722 N. HANCOCK ST., PHILADELPHIA, PA.

"TITAN for QUALITY"

DYES, DETERGENTS and TEXTILE SPECIALTIES

★

The Impossible is "that" which we have not yet tried to do

TITAN CHEMICAL PRODUCTS
INCORPORATED
MILL ROAD and WAYNE STREET
JERSEY CITY 6, NEW JERSEY
Representatives in: HINSDALE, N. H., KNOXVILLE, TENN.

DYESTUFFS

•

SPECIALTIES

BICK & CO., Inc.
Manufacturing Chemists
Reading, Pa. Charlotte, N. C.

Where Fast, Even
WETTING
and
PENETRATION
are
Necessary . . .
and also for
Rewetting in
SANFORIZING

AQUAKAL 74

is quick and effective

•

Also a fast wetting agent and penetrant for dyeing packages, piece goods, skeins and raw stock.

Kali

MANUFACTURING COMPANY
Manufacturing Chemists
427 Moyer St. Philadelphia 25, Pa.

See us at Booth 51, Knitting Arts Exhibition, Atlantic City, April 29 thru May 2.

QUALITY **RICHMOND** PRODUCTS

CUT DOWN DYEHOUSE
Headaches
USE

DYETEX

- Disperses Dyestuff
- Scours
- Used in Scrooping

DYETEX

Send for free sample and full information

RICHMOND OIL, SOAP & CHEMICAL CO., Inc.
1041-43 FRANKFORD AVE., PHILADELPHIA 25, PA.

RAPIDASE

for de-sizing cottons, rayons and mixed goods

•

Assures rapid, dependable de-sizing.

•

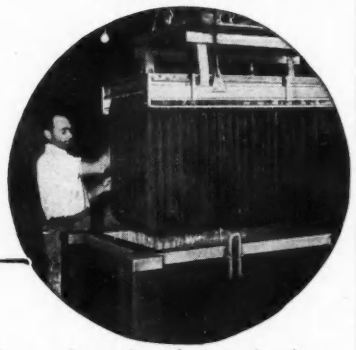
Our technical staff always at your service.

•

WALLERSTEIN COMPANY, INC.

180 MADISON AVENUE • NEW YORK 16

Clearer, more even dyeing, *faster* with *Laurel* WOOL SCOURING COMPOUNDS



YOU are sure of clean, soft wools and worsteds, clearer, more even dyeings when you use Laurel Scouring Compounds. Known for their speedy detergent action and used by leading mills for over thirty-five years, Laurel Scouring Compounds remove grease, oil, dirt quickly, economically, without injury to fibers. Keep mineral oils in suspension. Leave wool lofty and with soft hand . . . level dyeing. Available now. Send for trial order today. Let Laurel Scouring Compounds help you improve quality production and deliveries.

LAUREL WOOL OILS • LAUREL FULLING COMPOUNDS

• SOAPS • OILS • FINISHES •

LAUREL SOAP MANUFACTURING CO., Inc.

Wm. H. Bertolet's Sons • *Established 1909*

WAREHOUSES—PATERSON, N. J. • CHATTANOOGA, TENN. • CHARLOTTE, N. C.

OFFICES—2601 East Tioga Street, Philadelphia 34, Pa.

Solvay Chlorine ...

for Uniform LOW COST Bleaching

SOLVAY LIQUID CHLORINE is a bleaching agent that gives uniform results. You are not experimenting with SOLVAY Liquid Chlorine. It is the oldest successful bleaching agent, and is the *lowest in cost!*

DO AS SO MANY BIG textile houses do . . . specify SOLVAY Liquid Chlorine. Not only is it economical to use, but you always get controlled quality, purity and uniform results.

Safeguards against spotty bleaching

Controls the quality of water

SOLVAY LIQUID CHLORINE

SPECIFY QUALITY ... SPECIFY SOLVAY

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 Rector Street **New York 6, N. Y.**

BRANCH SALES OFFICES:

Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • St. Louis • Syracuse

• CLASSIFIED ADVERTISEMENTS •

WANTED: Print Colorist for plant located on West Coast. Must be experienced in roller printing and processing of silk, acetate, viscose and mixtures. When applying please mention age, marital status, salary expected and experience. Write Box 181.

CONFIDENTIAL EMPLOYMENT SERVICE—For Dyers, Chemists, Colorists, Managers, Superintendents and others seeking positions and for employers seeking men. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over 45 years in business.

DYESTUFFS WANTED, ALL TYPES, LARGE AND SMALL QUANTITIES, EXCESS INVENTORIES, ALSO INTERMEDIATES AND CHEMICALS. Write Box 171.

WANTED: Young textile chemist and colorist to take charge of laboratory. Must be well versed in laboratory control work on wool, rayon and cotton fabrics. State qualifications, age and salary desired. Write Box 194.

WANTED: SALESMAN — With knowledge of dyes and textile specialties, and experience and personal contacts to cover the South for reliable firm, who has business established in southern mills. State age, selling experience, details and salary expected. Prefer one living in South. Write Box 188.

POSITION WANTED: Experienced Dyer on cotton, rayon, acetate piece goods. Some bleaching and finishing experience. Write Box 185.

WANTED: Graduate Chemist for modern dyehouse in the Metropolitan Area. Must either be a Textile School Graduate or a Chemistry Major with Textile Chemistry experience. Excellent opportunity for the right man. Write Box 196.

WANTED: Textile Colorist for Modern Print Shop in the Metropolitan Area. Write Box 197.

POSITION WANTED: Hosiery Dyer with several years experience on ladies' hose of Silk, Nylon, Rayon and Cotton. Available for employment on request. Either as Head Dyer or Assistant to Head Dyer. Write Box 198.

POSITION WANTED: Chief Chemist, analytical and textile development expert. Married with family, currently employed in responsible position by a large textile specialty manufacturer. Have acquired the ability to set up and maintain a complete program for testing and development work in the two years of laboratory work with this firm but desire connection with progressive company offering greater opportunities. Present salary $4,000. Philadelphia area preferred. Write Box 201.

WANTED: Superintendent for Screen Printing Plant Located in South. Applicant should have thorough knowledge of Silk Screen Printing, preparation of dyestuffs, aging and washing. State full particulars of education and experience, with references to first letter. Write Box 199.

DYER WANTED

THOROUGH KNOWLEDGE IN DYEING ALL TYPES OF WOOLEN AND WORSTED YARNS. EXCELLENT OPPORTUNITY FOR RIGHT MAN. STATE EXPERIENCE IN DETAIL AND SALARY EXPECTED. NEW YORK LOCATION. OUR KEY MEN ARE AWARE OF THIS AD. ALL REPLIES HELD STRICTLY CONFIDENTIAL. WRITE BOX 200.

POSITION WANTED: Colorist-Chemist, Screen Printing, desires change of employment. Age 30, Textile Institute graduate. Ten years experience with rapidogens, indigosols, chromes, acetates and directs. Can set up colorshop and laboratory to function smoothly and efficiently. Capable of figuring costs per yard. Seeking responsible position with progressive firm, any part of the U. S. or South America. Write Box 202.

WANTED: Worsted Skein Dyer, in Commission Dyehouse in Brooklyn. Three K. W. Machines. This position offers an excellent opportunity to a man able to get out production. Write Box 203.

TECHNICAL SALES

Established Chemical Company requires two young Chemists or Engineers for new textile sales department. Textile mill or laboratory experience required. Age 28-35 preferred. One man will be located in the South, the other in New England. Address summary of education and experience, salary requirements and availability to Box 506, Norwalk, Conn.

WANTED: Textile Chemist, between 25 and 35 years of age, with training in textile operations and structural chemical fabric defects. A practical knowledge of dyeing and finishing operations is desired. Man should understand processing defects and be capable of trouble shooting and in cooperating with sales. Include recent photograph, outline of education, experience, pertinent personal data and salary required to Box 206.

POSITION WANTED: Night Superintendent supervising all operations in roller printing plant desires change. Experienced Dyer on all fibers. Seventeen years in the dyeing and printing field. Textile school graduate. Write Box 205.

WANTED: Young Textile Chemist as dyer of Warp Knit Fabrics. Excellent opportunity with progressive firm. Kindly forward photograph with record of experience and state salary expected. Write Box 204.

Manufacturers of

ANILINE -- ALIZARINE -- CHROME

and

ACETATE DYESTUFFS

FUGITIVE WOOL TINTS
FINE ORGANIC PIGMENTS
TANNIC ACID and CHEMICALS

Our laboratories are always at your service

ZINSSER & COMPANY, Inc.
ESTABLISHED 1897
Manufacturing Chemists
HASTINGS-ON-HUDSON NEW YORK

QUALITY RICHMOND PRODUCTS

Less Handling with

AFTER CHLOR
Eliminates 3 to 5 Handlings

Bleach with
Hypochlorite
Rinse and Use

AFTER CHLOR
THAT'S ALL

Write for FREE Sample

RICHMOND OIL, SOAP & CHEMICAL CO., Inc.
1041-43 FRANKFORD AVE., PHILADELPHIA 25, PA.

VIRGINIA

SODIUM HYDROSULPHITE
AND **SO_2**

Progressive textile processors are cutting costs with specialized equipment, developed by VIRGINIA, for application of these two textile stand-bys. Ask your VIRGINIA representative about the "Hydromiser" for regulating the feed of Sodium Hydrosulphite, and VIRGINIA'S semi-automatic antichlor method for controlling SO_2 concentrations in the sour box.

Offices and Stocks in:
New York • Boston
Philadelphia
Detroit • Charlotte

VIRGINIA
SMELTING COMPANY
WEST NORFOLK, VIRGINIA

AROMINE

DYE-BATH ASSISTANT

This versatile textile wet-processing aid is most unique. It combines the properties of a fast wetting agent, synthetic organic detergent, and water normalizer. AROMINE is a much better than average penetrant and dyeing assistant, and is at the same time an excellent detergent and scouring medium. Furthermore, AROMINE will prevent the formation of insoluble soap spots and scums, and remove them if already present.

AROMINE is effective in hard or soft water, acid or alkaline baths. Surprisingly small quantities are required for most textile applications. It is safe to say that there is no other textile chemical quite like AROMINE available.

BURKART-SCHIER CHEMICAL CO.
CHATTANOOGA, TENNESSEE
MANUFACTURING CHEMISTS FOR THE TEXTILE INDUSTRY

BURKOL

SYNTHETIC DETERGENT

BURKOL is a true detergent. That is, it possesses scouring and cleansing power to a marked degree, whereas the majority of the so-called synthetic organic detergents are primarily wetting agents.

BURKOL is economical to use, because it is low in cost and but a little is required for effective results. It is well suited for scouring and boiling off all types of textiles, including raw stock, yarns, hosiery, and fabrics. **BURKOL** may be applied in hard or soft water.

Goods scoured with **BURKOL** acquire a pleasing soft finish, which is well-retained through subsequent dyeing operations, so that usually no further finishing is required.

BURKART-SCHIER CHEMICAL CO.
CHATTANOOGA, TENNESSEE
MANUFACTURING CHEMISTS FOR THE TEXTILE INDUSTRY

INDEX TO ADVERTISERS

Althouse Chemical Co.	Second Cover
Amalgamated Chemical Corp.	
American Aniline Products Inc.	III
American Cyanamid Co. (Ind. Chem. Div.)	Third Cover
American Cyanamid Co. (Textile Resin Dept.)	XVIII
American Dyewood Company	
American Key Products, Inc.	XXIV
Arkansas Company, Inc.	VII
Arnold, Hoffman & Co., Inc.	VII
Atlantic Chemical Co., Inc.	XXIV
Atlas Electric Devices Co.	XXIV
Becco Sales Corp.	V
Bick & Co., Inc.	XXVI
Blickman Co., S.	
Burkart-Schier Chemical Co.	XXX
Butterworth Sons, Co., H. W.	XXXII
Calco Chemical Division American Cyanamid Co.	XXIII
Calgon, Inc.	
Campbell & Co., Inc., John	IV
Carbic Color & Chemical Co., Inc.	XX
Carbide & Carbon Chemicals Corp.	
Ciba Company, Inc.	
Colgate-Palmolive-Peet Co.	
Commonwealth Color & Chemical Co.	XXV
De Paul Chemical Co. Inc.	
Drew & Co., E. F.	XV
DuPont de Nemours & Co., E. I. Dyestuff Division	Front Cover
Emery Industries, Inc.	
Fallek Products Co., Inc.	
Fancourt & Co., W. F.	VI
Geigy Company, Inc.	
General Chemical Co.	
General Dyestuff Corp.	
Girdler Corp., The	
Givaudan-Delawanna, Inc.	
Grinnell Co., Inc.	
Hardesty Co., W. C.	
Hart Products Corp.	
Heyden Chemical Co.	
Hooker Electrochemical Co.	
Interchemical Corp., Textile Colors Div.	
International Salt Co., Inc.	
Kali Manufacturing Co.	XXVI
Kelco Co.	IX
Laurel Soap Mfg. Co., Inc.	XXVII
Leatex Chemical Co.	XXV
Leeds & Northrup Co.	
Linotone Corp.	
Maher Color & Chemical Co.	
Mathieson Alkali Works, Inc.	
Maywood Chemical Works	
Monsanto Chemical Co.	
Myles Salt Co. Ltd.	
National Aniline Division, Allied Chemical & Dye Corp.	XIII
National Carbon Co.	
National Oil Products Co.	
National Starch Products, Inc.	XI
Nova Chemical Corp.	
Nuodex Products Co., Inc.	
Nyanza Color & Chemical Co., Inc.	VIII
Onyx Oil & Chemical Co.	XVII
Pabst Sales Company	XXXI
Perkins & Sons, Inc., B. F.	
Philadelphia Quartz Co.	
Procter & Gamble	
Refined Products Co.	XIX
Richmond Oil, Soap & Chemical Co., Inc.	XXVI, XXIX
Rohm & Haas Co.	XXII
Royce Chemical Co.	
Rumford Chemical Works	XVI
Sandoz Chemical Works	
Scholler Bros., Inc.	Back Cover
Socony-Vacuum Oil Co., Inc.	
Solvay Sales Corp.	XXVII
Standard Brands, Inc.	
Standard Chemical Products, Inc.	
Standard Fabricators Inc.	
Standard Oil Co. of N. J.	
Tennessee Eastman Corp.	
Textile Book Publishers, Inc.	XXXI
Titan Chemical Products, Inc.	XXV
Ultra Chemical Works	
Union Carbide & Carbon Corp.	
United Chemical Prod. Co.	
Vanderbilt Co., Inc., R. T.	XII
Van Vlaanderen Machine Co.	X
Virginia Smelting Co.	XXIX
Wallerstein Co., Inc.	XXVII
Warwick Chemical Co.	
Watson-Park Company	
Wolf & Co., Jacques	
Young Aniline Works	
Young Co., J. S.	XXXI
Zinsser & Co., Inc.	XXIX
Zurn Co., O. F.	

It's money in the bank WHEN YOU

DESIZE with EXSIZE!

As SO MANY mill operators know, our natural enzyme desizer will finish hundreds of yards of cotton or cotton-mixed cloth for only a few pennies.

What's more... Exsize contains no harsh chemicals... dilutes very readily ...works gently, leaving fabrics elastic, soft, with good "hand." Further, dyeing is sure to be level.

Just get in touch with our Pabst Technical man... he'll be delighted to study your particular problems... help you solve them either in our laboratories or your own mill.

WRITE FOR FREE BOOKLET

PABST BREWERIES

Copr. 1947, Pabst Brewing Company, Milwaukee, Wisconsin

PABST SALES COMPANY

CHICAGO, ILLINOIS

Warehouses at Jersey City, and Textile Warehouse Company, Greenville, S. C.

NOW READY!

THE INDISPENSABLE BUYERS' GUIDE TO TEXTILE CHEMICAL PRODUCTS

At your fingertips—a handy reference to more than 2000 products of 193 manufacturers in the textile chemical field! The 4th edition of the TEXTILE CHEMICAL SPECIALTY GUIDE is scientifically compiled. Completely revised and up-to-date, it is the only book which covers the entire market of textile chemicals. Edited by H. R. Mauersberger, technical editor of Rayon Textile Monthly, this comprehensive volume will prove an invaluable time and money-saver. Only $5 (in U. S. and Canada); $6 in foreign countries.

Write for your copy today!

Textile Book Publishers Inc., 303 Fifth Ave., New York 16, N.Y.

Gentlemen:

Please send me postpaid at once the new 4th edition of the TEXTILE CHEMICAL SPECIALTY GUIDE. Inclosed is $5 ..check ..M.O. ..cash.

Name.....Title.....

Company.....

Street.....City.....State.....

LOGWOOD BLACK

FOR

LEATHER • WOOL • SILK

COTTON • FUR • HAIR

PIGMENTS

DEPENDABLE SOURCE OF SUPPLY

ECONOMICAL - RELIABLE

LOGWOOD HEMATINE QUEBRACHO
TANNIC ACID SUMAC QUERCITRON
FUSTIC GAMBIER FLAVINE

YOUNG EXTRACTS—SERVING THE INDUSTRY SINCE 1869

THE J. S. **YOUNG** COMPANY

OFFICE and FACTORY
2701-2733 Boston St., Baltimore, Md.

Your Profit may depend on where you place this machine

Take a look at your wet finishing equipment—do you have all the machines you need and are they in the correct position to meet today's production demands?

In many mills production is slow, costs are high because of wasted labor resulting from out-of-date production lines. Butterworth engineers have spent years studying this problem of the Textile Industry. As a result, improvements have been made in production facilities, machines have been designed and redesigned to minimize or eliminate production shortcomings.

Butterworth makes all the machines required for fast, modern production — in bleaching, boiling-out, drying, calendering, or dyeing. Whether your mill requires a single machine or a complete range, you can depend on the unique Butterworth experience of 127 years of designing and building equipment for the wet end of Textile Finishing.

Butterworth engineers are ready to help you place new machines or rearrange your present ones to increase production, eliminate wasted labor, and make the most effective use of available floor space. Write us today.

Butterworth

H. W. Butterworth & Sons Company, Philadelphia 25, Pa.

TEXTILE FINISHING MACHINERY COMPANY DIVISION, Providence, R. I. - 1211 Johnston Bldg., Charlotte, N. C. - W. J. Westaway Co., Hamilton, Ont. ARGENTINA: Storer & Cia., Buenos Aires - AUSTRALIA: Noel P. Hunt & Co., Ltd., Melbourne - BELGIAN CONGO: Paul Pflieger & Co. - BOLIVIA: Schneiter & Cia., Ltda., La Paz - CHILE: Schneiter & Cia., Ltda., Santiago - COLUMBIA: C. E. Halaby & Co., Medellin - CUBA: Thos. F. Turrull, Havana - ECUADOR: Richard O. Custer, S. A., Quito - FRANCE: Georges Campin, Le Perreux, Seine; Rene Campin, Sceaux, Seine - MEXICO: I. Slobotzky, Mexico, D. F. - MIDDLE EAST: Arlind Corporation - NORWAY: Dr. Ing. Otto Falkenberg, Oslo - PERU: Custer & Thommen, Lima - SOUTH AFRICA: Texmaco, Johannesburg - SWEDEN: Elof Hansson, Goteborg - URUGUAY: Storer & Cia., Ltda., Montevideo - VENEZUELA: Herbert Zander & Co., Caracas.

IF WATER IS ONE OF YOUR RAW MATERIALS . . . AFFECTS YOUR PRODUCT OR PROCESS IN ANY WAY . . .

New FILT-R-STIL* Water Demineralizing Unit DELIVERS

MINERAL-FREE WATER TO HELP YOU . . .

- **Improve Product Quality**
- **Lower Processing Costs**
- **Simplify Operations**

Now, thanks to Cyanamid's FILT-R-STIL Demineralizing units, you can have quality-controlled water day-in and day-out . . . water which is chemically equal or superior to distilled. FILT-R-STIL Demineralizers are economic, too. The IONAC* Resins used make the process comparable to a simple cold filtration. The added expense of heat, cooling water and periodic dismantling have all been eliminated.

All standard units (capacity from 5 to 1200 or more gallons per hour) are compact and completely self-contained. And the ease with which they're installed, operated and maintained further assures long, efficient service and reliable results. For complete data on FILT-R-STIL Demineralizers and assistance in solving *your* water problems—mail coupon *today*.

AMERICAN CYANAMID COMPANY
ION EXCHANGE PRODUCTS DEPARTMENT
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

*Reg. U. S. Pat. Off.

How a FILT-R-STIL Demineralizer works . . . Units consist of four "beds" of IONAC* Resins which, by principle of ion exchange, successively remove the dissolved minerals from water. Water is fed through a conductivity cell which indicates quality of water being produced. When resins are exhausted, a regenerative system restores units to full efficiency.

American Cyanamid Company,
Ion Exchange Products Dept. 10
30 Rockefeller Plaza, New York 20, N. Y.
Send me your free booklet on FILT-R-STIL. A.D.R.1
Briefly, my water problem is of the following nature:

_____

_____

_____

*Name*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

DO NOT CIRCULATE

DO NOT CIRCULATE

DO NOT CIRCULATE

DO NOT CIRCULATE

lasting beauty
...is innate, not purely surface. DuraBeau Finish becomes an inherent part of the fibre.
DuraBeau Finish gives hosiery an exquisite, gossamer sheerness... and is a "film of protection" against snags and spots. It is a Finish that is deep seated... will wear and wear and wear. It is that glorious, smooth Finish that women love... that makes them feel grateful to you, who have made them feel well "leg-groomed."
DuraBeau
Reg. U. S. A. and Canada
SCHOLLER BROS., INC.
Mfrs. of Textile Soaps, Softeners, Oils, Finishes • Collins & Westmoreland Sts., Phila. 34, Pa. • St. Catharines, Ont., Can.